OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

AMERICAN DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY • BLEACHING • DYEING • PRINTING • FINISHING

MAY 14, 1951
VOLUME 40, No. 10

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Du Pont Vat Colors are well known for all-round fastness to sun, laundering, perspiration or dry cleaning. And Du Pont vat dyes assure you deep penetration, uniformity and brilliance.

You can choose your colors from a wide selection—in Du Pont PONSOL* and LEUCOSOL* (anthraquinone-type dyes) and SULFANTHRENE* (indigoid and related dyes.) Our Technical Staff will be glad to help you find the right dye—and the right method of application—for all of your fabrics.

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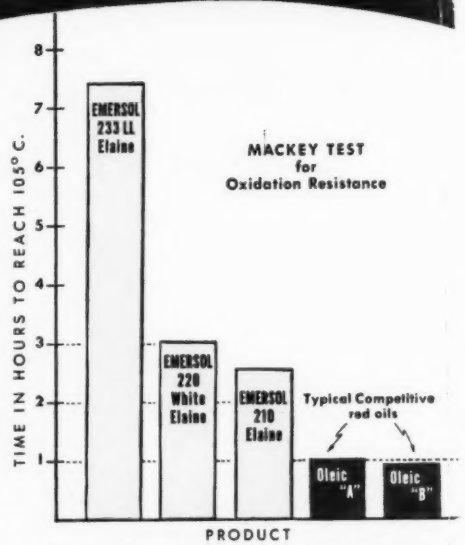

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A Amanthrene*

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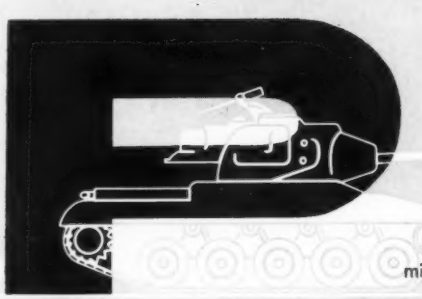
DARK OLIVE B



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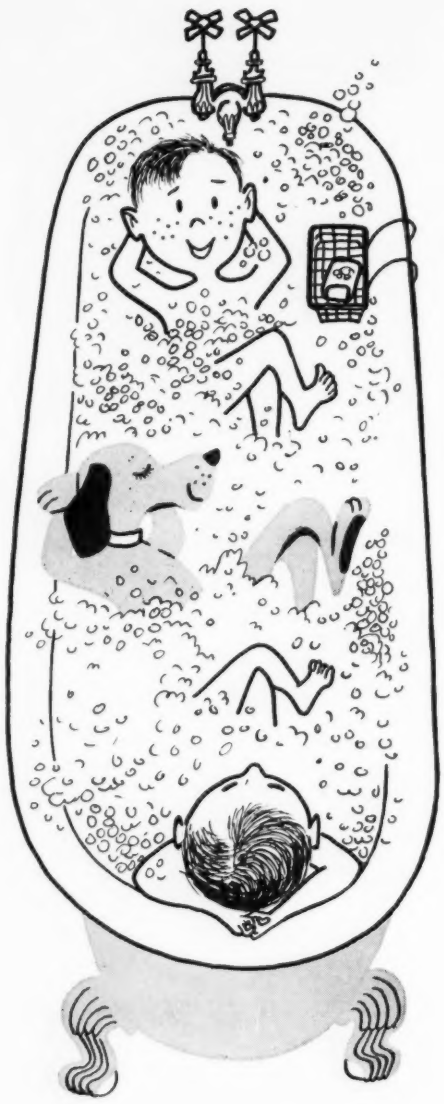

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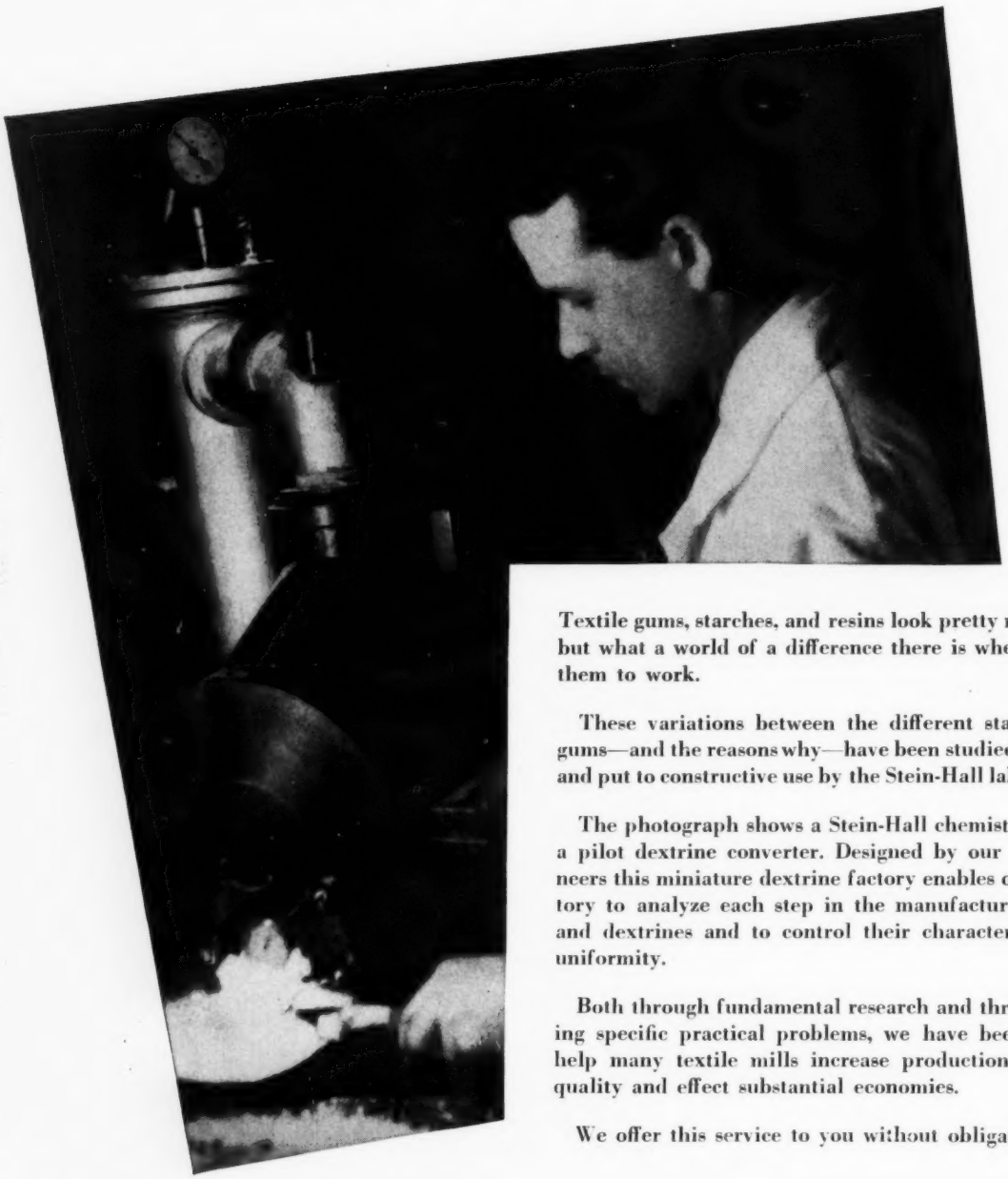

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These variations between the different starches and gums—and the reasons why—have been studied, analyzed and put to constructive use by the Stein-Hall laboratories.

The photograph shows a Stein-Hall chemist operating a pilot dextrine converter. Designed by our own engineers this miniature dextrine factory enables our laboratory to analyze each step in the manufacture of gums and dextrines and to control their characteristics and uniformity.

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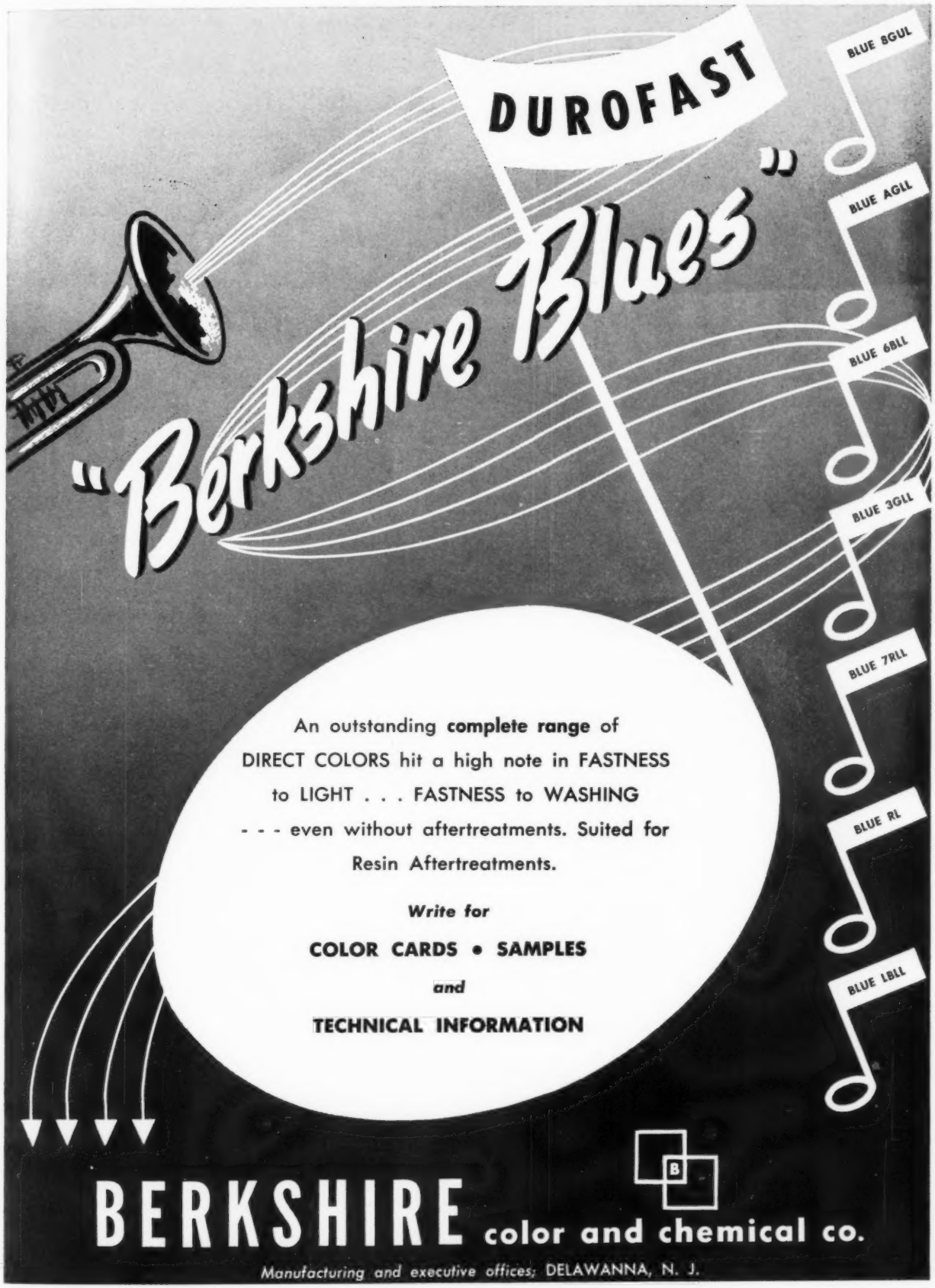
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APPLICATION	NAME	COTTON	RAYON	WOOL	NYLON	SILK	LINEN	CHEMICAL NATURE
ANTI-SLIP	WEAVE-LOK*		X		X			water-soluble processed natural resin
ANTI-SLIP	FORMASET* HG		X	X	X			inorganic polymer semi-durable
COATING								
NON VOLATILE	PLASTISOL	TEXTILES, PAPER						vinyl resin dispersions
VOLATILE	ORGANOSOL	TEXTILES, PAPER						vinyl resin dispersions
COLOR FIXATIVE	WARCOFIX*	X	X	X	X	X	X	quarternaryammonium compound
COLORS, DISPERSED	SUNTONE*	VINYL						pigments dispersed in resinous and chemical plasticizers
COLORS, PAD DYEING	SUNTONE*	X	X	X	X	X	X	dispersed pigments and resinous binders
COLORS, PRINTING	SUNTONE*	X	X	X	X	X	X	dispersed pigments and resinous binders
COLORS, PRINTING	SUNTONE*	PLASTICS						dispersed pigments and resinous binders
FINISHES								
BODYING AGENTS	SETOLE* AF	X						aqueous dispersions of thermo-setting resins
CRUSH RESISTANT	FORMASET* SN		X					methylolurea type thermo-setting resin
DULLER	ANTILUSTEROLE*		X		X			aqueous dispersion of inorganic pigments
FIRE RETARDANT	WARCONYL* A	X	X					blend of inorganic salts
GLAZING (DURABLE)	FORMASET* 10-D	X						dimethylurea-ether polymer
GLAZING (DURABLE)	FORMASET* SN		X					methylolurea type thermo-setting resin
MILDEW PROOFING	KUPRATE*	X	X	X	X	X	X	solubilized copper 8 quinolinolate
MILDEW PROOFING	G-4 EMULSION-20	X	X	X	X	X	X	emulsion containing 20% G-4. Compatible with emulsion-type water repellents.
RIBBON FINISH	SETOLE* D EXTRA		X					water-soluble alkyd resin
SEWABILITY FINISH	WARCO* A 221	X						non-ionic emulsion
SHRINK RESISTANT	FORMASET* SR	X	X					ketone aldehyde type thermo-setting resin
SHRINK RESISTANT	FORMASET* SN		X					methylolurea type thermo-setting resin
SHRINK RESISTANT	FORMASET* 10-D		X					partially polymerized urea-formaldehyde type resin
SHRINK RESISTANT	FORMASET* C	X	X	X	X		X	controlled formalizer of fibers—highly wash resistant
SOFTENERS								
ANIONIC	APPRETOLE*	X	X				X	alkyl amide dispersion
CATIONIC	APPRAMINE*	X	X		X		X	substituted fatty amide
HEAVY-BODIED	TORRIDEX*	X	X					sulfonated tallow
OXIDATION RESISTANT	WARCOLENE* 171	X	X				X	sulfated fatty acid ester
WATER REPELLENT DURABLE	NORANE* R	X	X					chloromethylated quaternary ammonium compound
WATER REPELLENT DURABLE	NORANE* W			X	X			wax emulsion plus metal salt complex
WATER REPELLENT RENEWABLE	IMPREGNOLE*	X	X	X	X	X	X	wax emulsion with polyvolent salts
GAS FADING INHIBITOR	WARCO* GFI		X					high molecular weight amino compound
GAS FADING INHIBITOR	WARCO* GND		X					mixed organic amines (non-durable type)
KIER BOILING COMPOUNDS	KIEROLE*	X	X				X	sulfonated fatty acids
KIER BOILING COMPOUNDS	COLOROLE*	X	X				X	sulfonated fatty acids
LUBRICANT (YARN, FABRIC)	WARCOLENE*	X						solubilized oil
LUBRICANT	WARCO* A 221	X						non-ionic emulsion
PENETRANTS—REGULAR	WARCOSOL*	X						sodium alkylnapthalenesulfonate
PENETRANTS—NON-FOAMING	WARCOSOL* NF	X	X	X				blend of organic esters
PENETRANTS—MERCERIZING	EUMERCIN*	X						cresylic and non-cresylic types
PIGMENT PRINT BINDERS	SUNTONE* CLEARS	X	X					emulsified resinous compounds
PIGMENT PRINT BINDERS	FORMASET* 20	X	X					partially polymerized urea-formaldehyde resin
TAR AND GREASE REMOVER	LANOLE*	X	X	X	X			detergent solution in organic solvent
SYNTHETIC DETERGENT	SULFANOLE* KB	X	X	X	X	X	X	sodium alkylarylsulfonate
SYNTHETIC DETERGENT	SULFANOLE* CP	X	X	X	X	X	X	sulfated fatty amide
SYNTHETIC DETERGENT	SULFANOLE* S GEL Conc.	X	X	X	X	X	X	sulfonated fatty amide
SYNTHETIC DETERGENT	SULFANOLE* AN	X	X	X	X	X	X	fatty acid amine condensate
WETTING AND REWETTING	WARCOSAN*B Conc.	X	X					sodium alkyl ester sulfate
WOOL SCOURING	LANOLE* B		X	X				stabilized organic solvent soap compound

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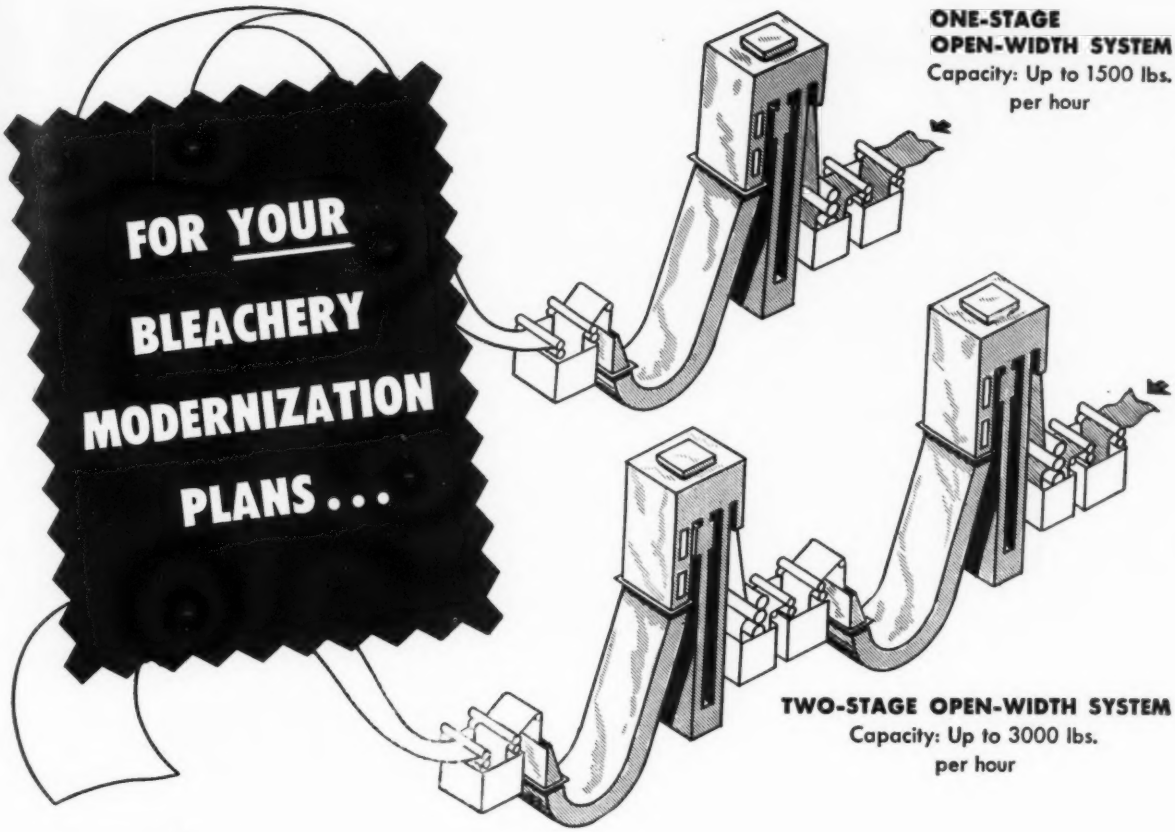

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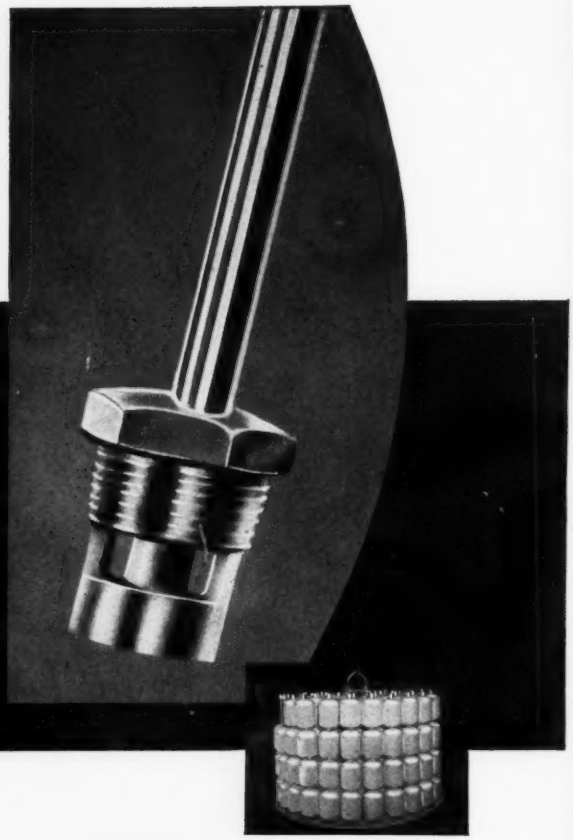

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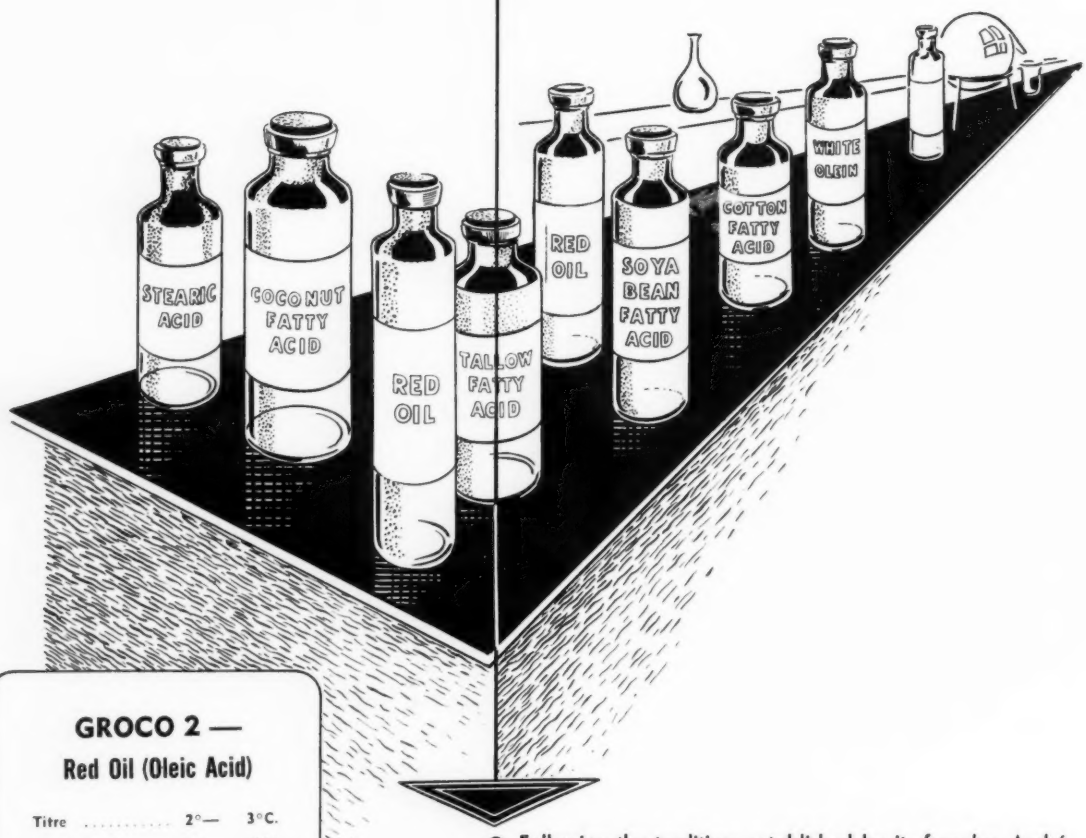

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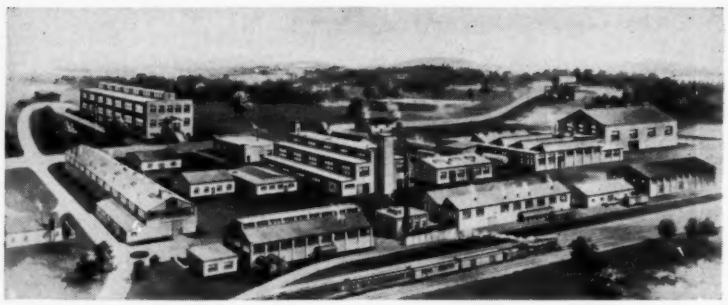

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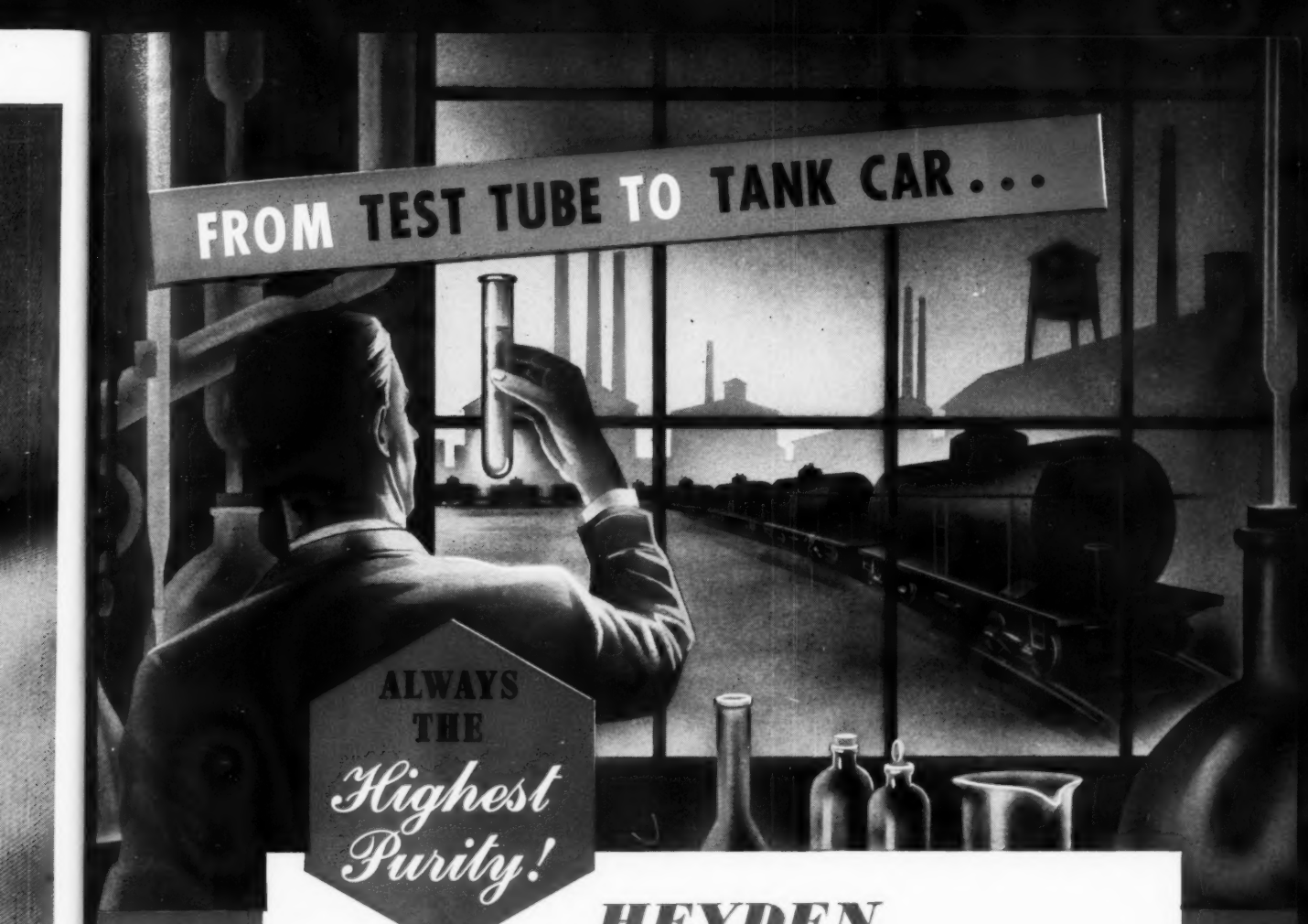

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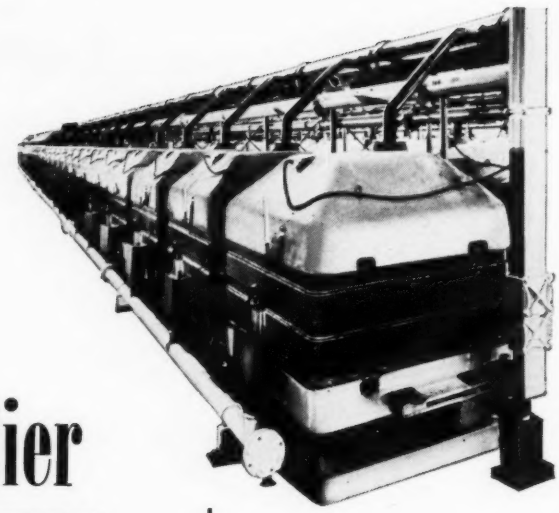

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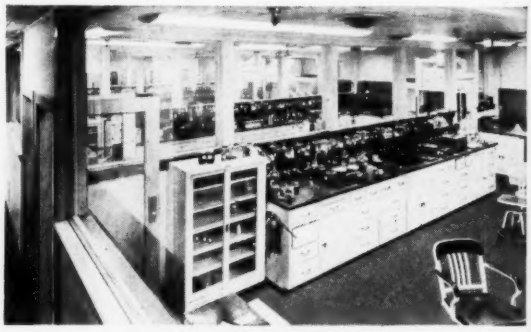

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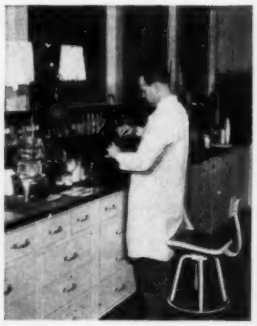

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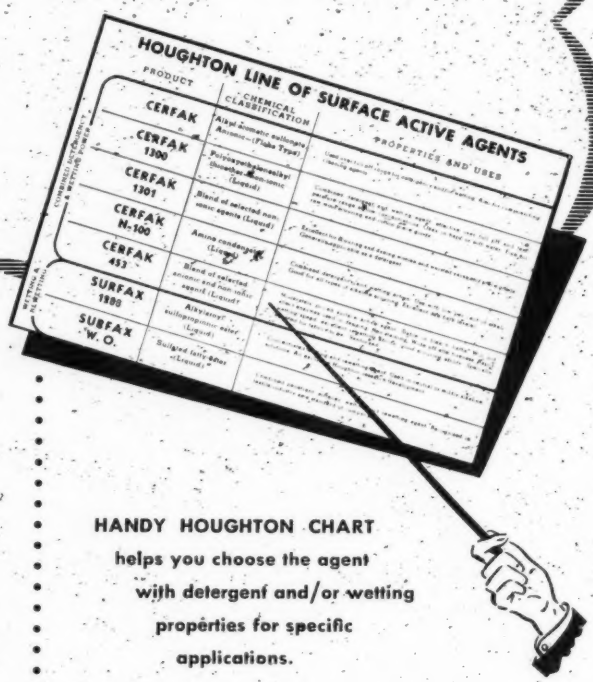

HANDY HOUGHTON CHART helps you choose the agent with detergent and/or wetting properties for specific applications.

● Textile mill men who ask us for help with their processing problems often bring up the same question. "You don't have to sell us on *using* good agents," they say, "it's just that there are hundreds of surface active agents, combining detergent, wetting and re-wetting properties to some extent. But—*which one is best* for our specific applications?" We've worked closely with mill owners to find the answer, and will be glad to pass it on to you. Our handy chart at the right will help. So will our descriptive bulletins. And to make another point clearer right at the start, here's how you can differentiate between the two Houghton trade names, too . . .

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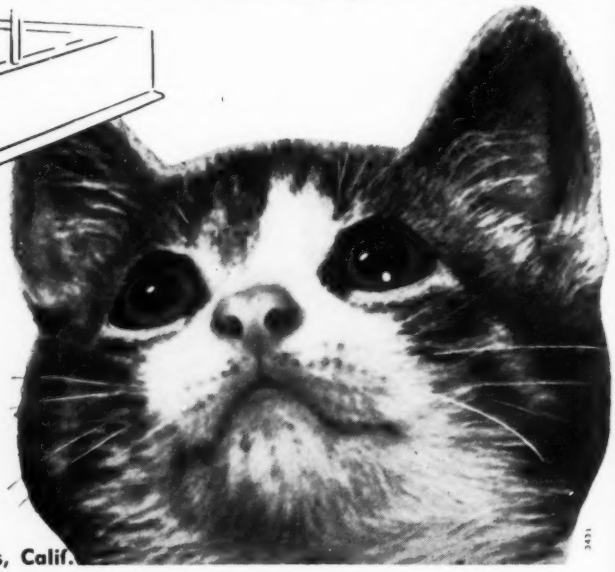

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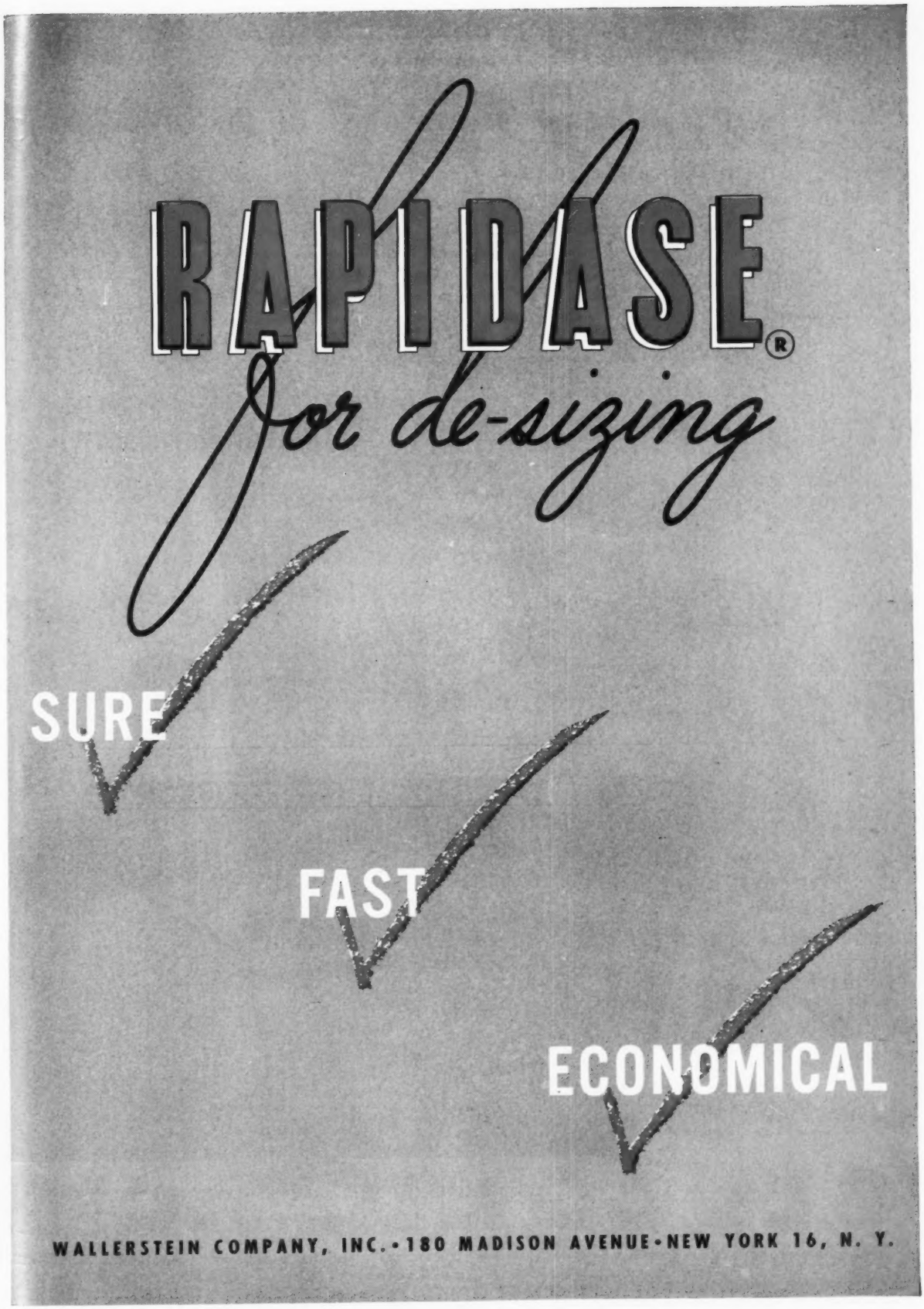
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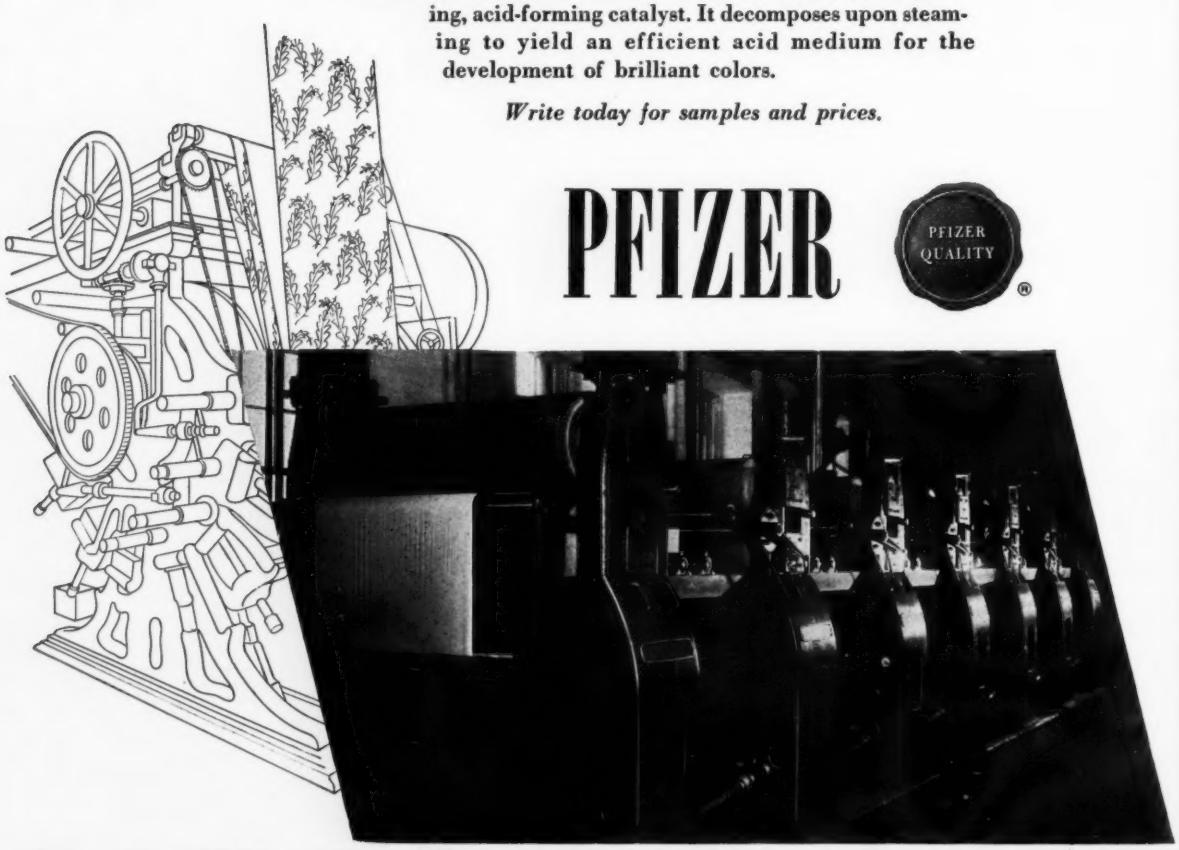

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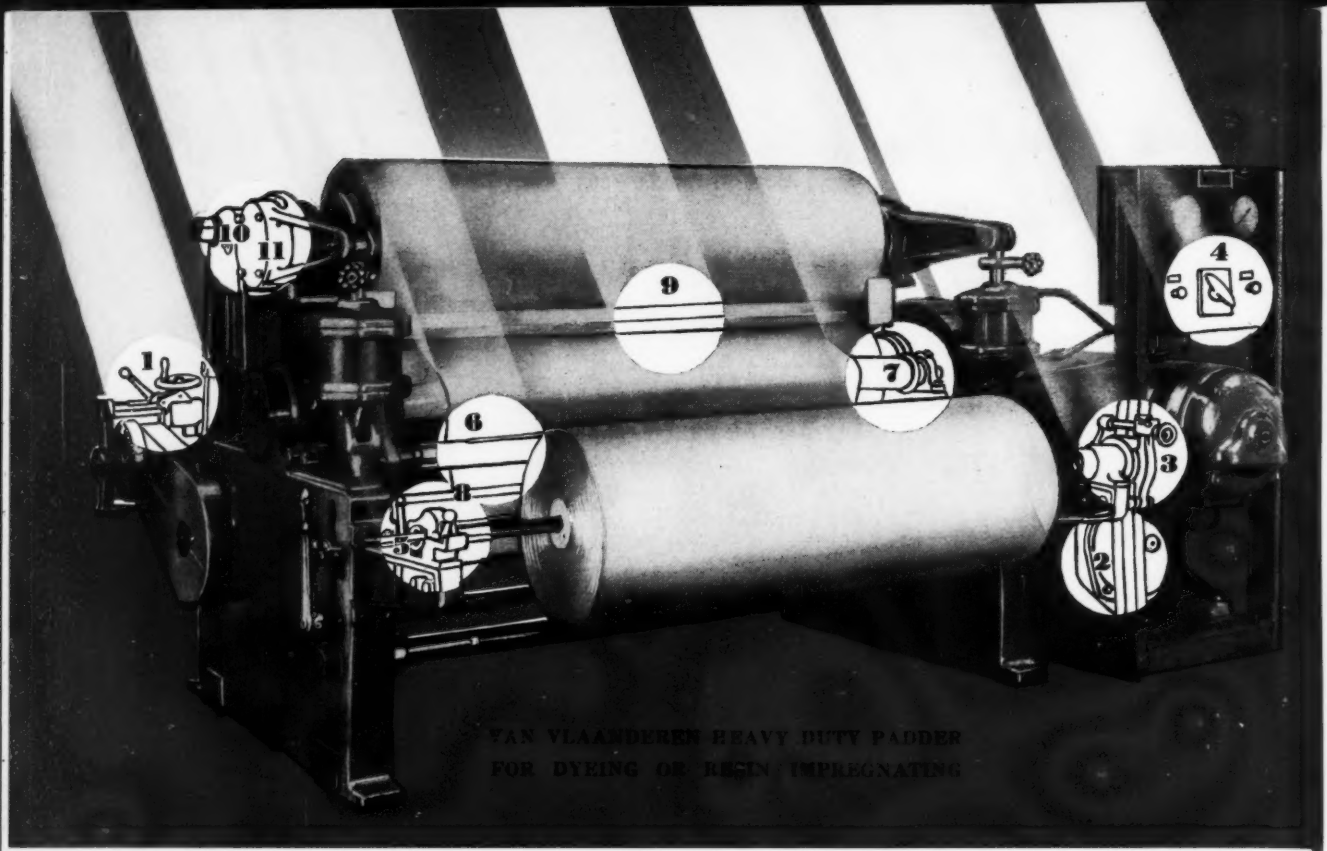

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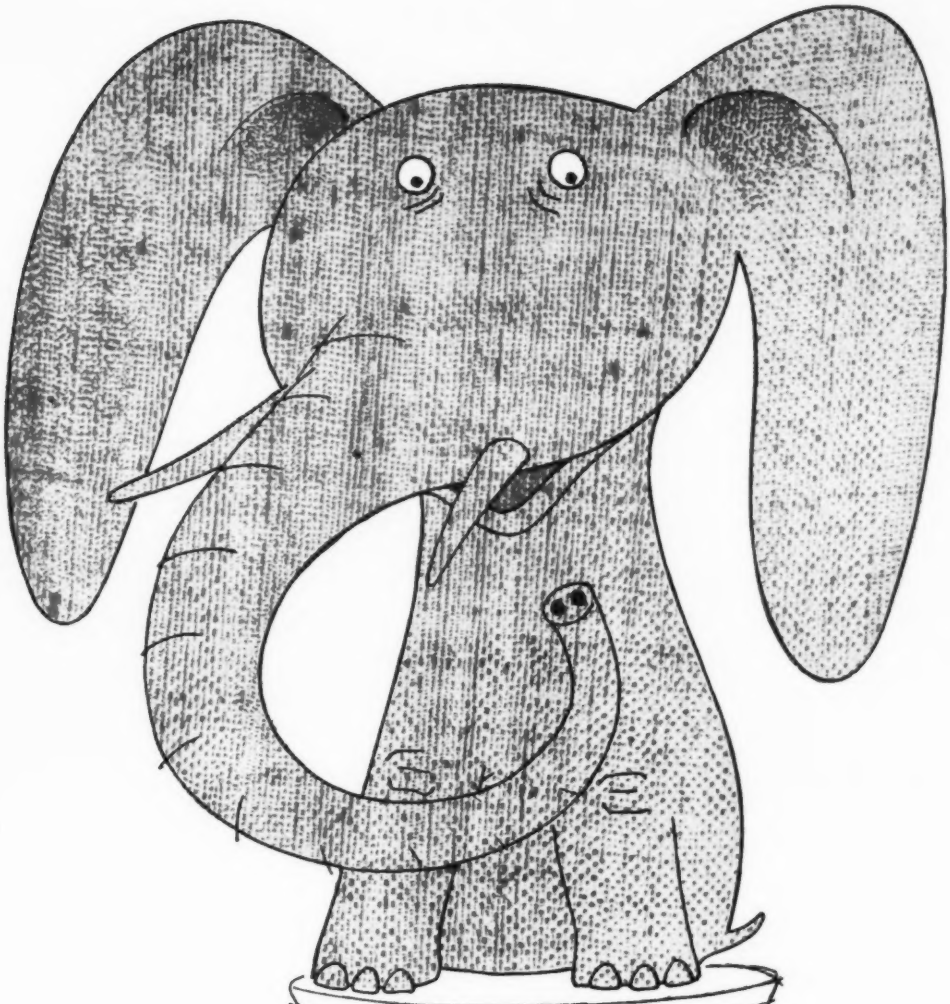

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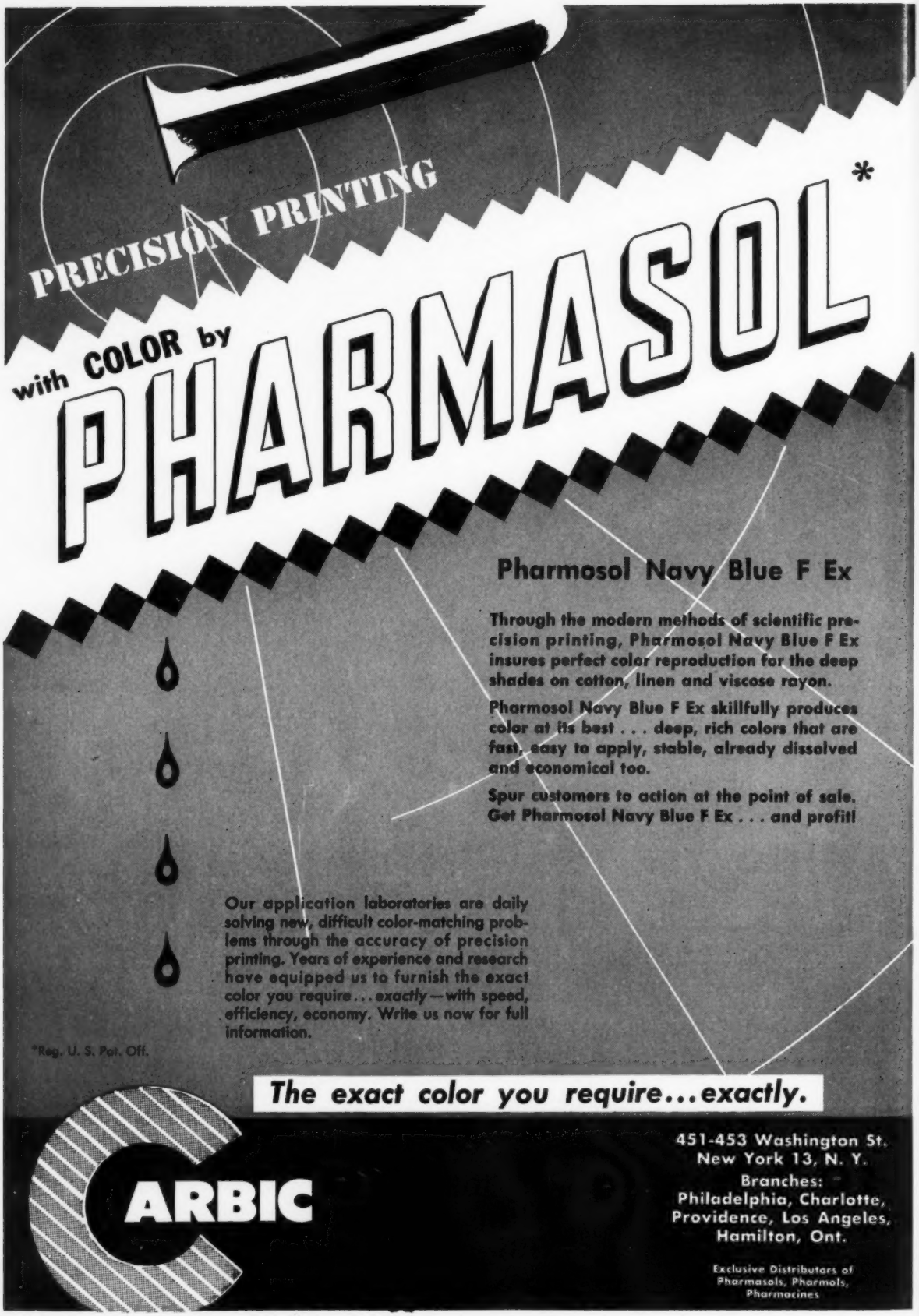
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MAY 14, 1951
VOLUME 40 NUMBER 10

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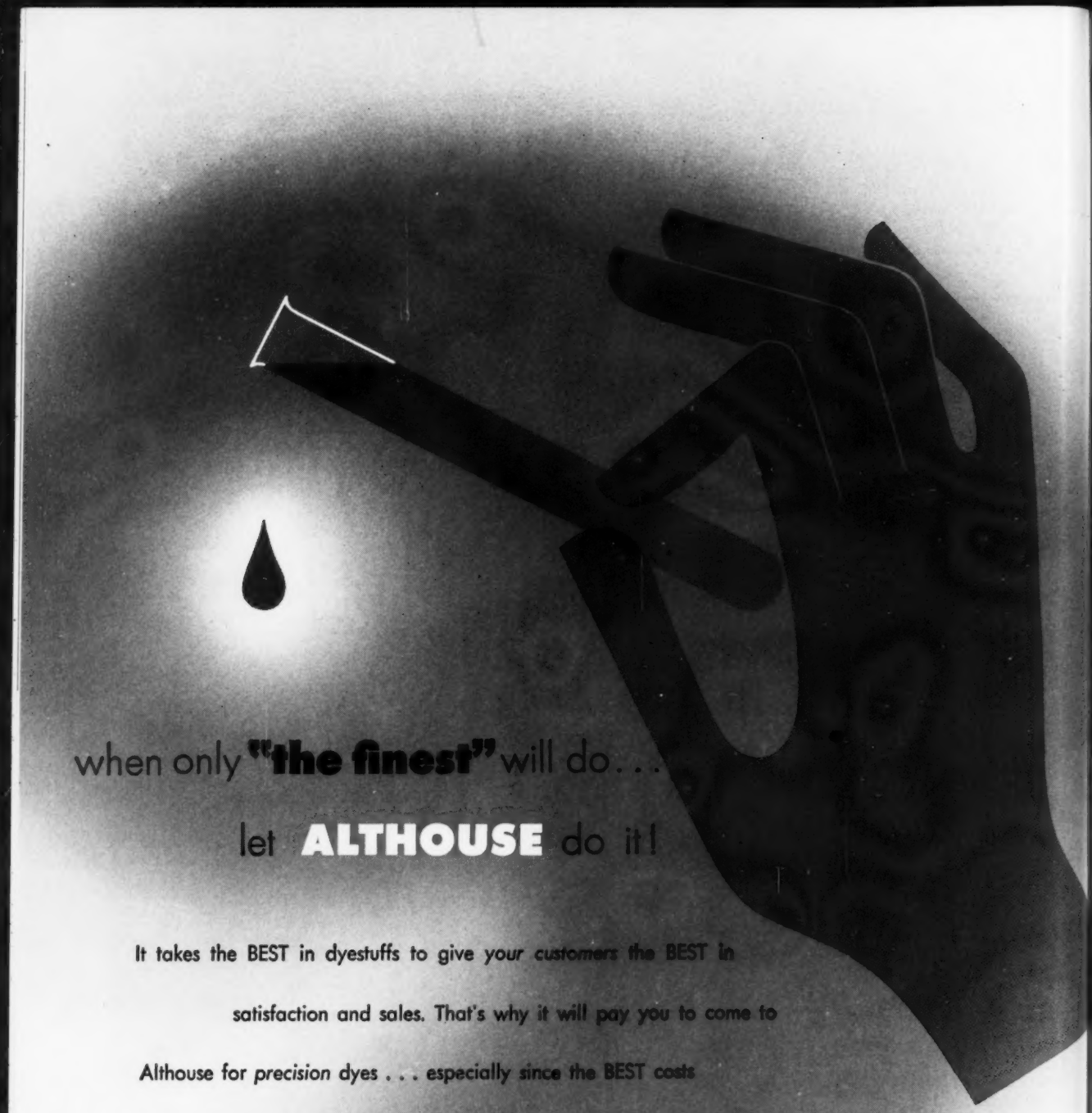

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VOLUME 40 MAY 14, 1951 NUMBER 10

LABORATORY EVALUATION OF THE WEAR RESISTANCE OF NONWOVEN FABRICS*

R G STOLL

Textile Materials Engineering Laboratory, U S Army

INTRODUCTION

NONWOVEN fabrics are now used more and more for expendable items such as hospital sheets, napkins, towels, diapers, wiping cloths, etc. They also serve as base material for coated fabrics and as the reinforcing member in plastic laminates. They may have potentialities as substitutes for woven fabrics in which hand and drape, appearance and long wear life are not prime requirements.

As to their structure, nonwoven fabrics represent planar assemblies of textile fibers held together either by mechanical interlocking in a random web or mat, by fusing (in the case of thermoplastic fibers) or by bonding with a cementing medium such as starch, glue, casein, rubber latex or one of the cellulose derivatives or synthetic resins. For the formation of the fiber lap, web or mat, various processes are being utilized, including (a) garnetting, (b) carding, (c) aerodynamic doffing and (d) a method using paper machinery *(2)*. The fiber orientation and the geometric form of these nonwoven fabric structures vary widely depending on the process used as well as the geometric form and inherent properties of the fiber material. However, it is possible to distinguish between the following principal structures: (a) card web, longitudinal orientation; (b) cross-lay card web, two directional orientation; (c) garnetted lap; (d) random fiber web, blown and (e) random fiber mat, flotation.

The development of optimum web formation and bonding processes and the systematic search for suitable applications for the various nonwoven fabric structures depend largely on the establishment of accurate and adequate test methods for evaluating their critical physical characteristics. Due to the nature of the cohesive forces which hold nonwoven fabrics together as well as the stresses to which they are subjected in service, determination of the abrasion resistance of these structures is considered to be as important as in the case of woven textile structures.

R G Stoll

The nature of the breakdown of nonwoven fabrics by complex mechanical wear actions is discussed. Flex abrasion and surface abrasion under dry and wet conditions are considered to be critical actions in service wear. Test procedures for measuring resistance to these actions by means of a new instrument are described and the results obtained on four bonded fiber webs are used to demonstrate the relative precision of the methods and their capacity to predict wear resistance in general.

Before describing the new test method and presenting some test results on nonwoven fabrics, a brief discussion of the nature of wear in textile structures in general and its measurement by laboratory techniques is in order, since much controversy on this subject has arisen due to insufficient consideration of some basic principles.

NATURE OF WEAR AND ITS SIMULATION BY LABORATORY TECHNIQUES

It is generally accepted that the resistance to service wear of textile structures cannot be satisfactorily characterized by such static mechanical tests as those for tensile, bursting or tearing strength. It has also been found that surface abrasion tests often do not correlate with the actual wear resistance of these structures. These discrepancies between physical laboratory characteristics and behavior in service wear may be caused by inaccurate results due to insufficient control of the test conditions as well as by the inadequacy of the tests with regard to simulating the complex forces which disintegrate textile structures in actual wear.

In exhaustive microscopical examinations of worn textile structures *(1)*, it has been found that the breakdown of a large proportion of the fibers is caused by transverse cracking. From the location of the points of maximum weakness in the textiles examined, this cracking appears to be the direct result of the flexing and bending stresses suffered during wear. It has also been found that the degradation of textile fabrics induced by abrasion and flexing around a thin bar is capable of producing data which are highly correlated to the results of statistically controlled wear tests *(3)*, *(4)*. It is only reasonable, therefore, to assume that the combined test action of flexing and abrasion,

* Prepared in connection with work done for the joint Nonwoven Fabrics Committee of the AATCC and the ASTM.

CSI - STOLL - QUARTERMASTER
UNIVERSAL WEAR TESTER

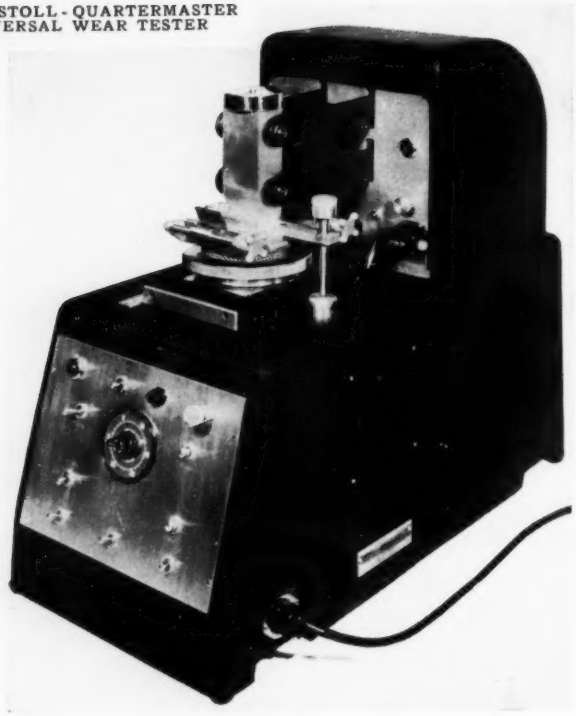


Figure 1

which will be described below, is as significant for the evaluation of nonwoven fabrics as it has been found for the more pliable woven fabrics. However, consideration of the resistance to plane surface abrasion cannot be neglected in an overall evaluation of the mechanical properties of nonwoven fabrics. The appearance of certain failures in items made of such structures indicates that frictional forces produced by rubbing the plane of the fabrics against other surfaces may also cause a breakdown of the bonds between the fibers and to some extent a cracking of the individual fibers, eventually forming a hole in wear.

Before describing the new test methods developed for measuring resistance to the two major wear factors mentioned above, it may be worthwhile to say something about the correlation and interpretation of flex and surface abrasion data in general. It may be found that these two characteristics when determined on a series of comparative samples show no correlation or even a negative relationship. A statistical analysis of the significance of the correlation between the two characteristics will indicate whether this discrepancy between flex and surface abrasion is real or due to experimental error. If real, the conflicting behavior may be caused by the inverse effect of certain structural characteristics on flexibility and surface abrasion resistance. A dense structure, for example, in which the fibers are firmly held by mechanical or chemical cohesive forces is rather resistant to surface abrasion, but has low resistance to flexing and bending since the limited freedom of fiber movement causes high stresses in the individual fibers which in turn result either in a cracking of the individual fibers or a breaking of the cemented or fused bonds. If the laboratory data which characterize the two major wear factors—resistance to surface abrasion and resistance to flex abrasion, in dry and wet conditions—show good correlation, interpretation of the results in terms of general behavior in actual wear presents no difficulties. If no correlation or an inverse relationship exists, it is necessary to estimate the relative importance of the resistance to flex and surface abrasion on the basis of the prospective end use of the samples. In general, however, the flex abrasion data for nonwoven fabrics will usually be rated higher in relative importance than the surface abrasion results.

In interpreting laboratory wear data, cognizance must also be taken of the principle of the weakest link, which means that in a fabric exposed to a chain of wear actions, poor resistance to any one specific action (for example, to flexing and bending stresses) cannot be compensated for by good resistance to another wear action (for example, surface abrasion) even if both are of similar relative importance in the overall complex of wear. A quantitative statistical evaluation of this problem, however, is very difficult since, for most end items, no data are available as to minimum functional requirements in terms of physical characteristics such as tearing strength or resistance to flexing and abrasion.

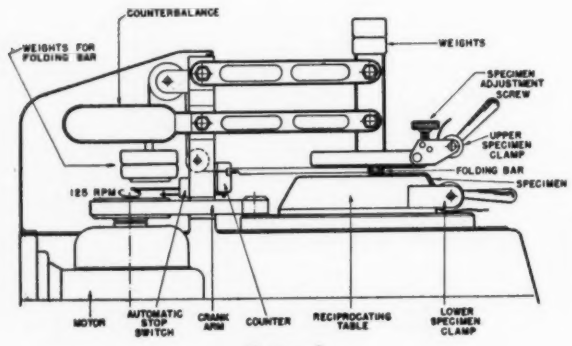


Figure 2

Diagram of Stoll-Quartermaster Universal Wear Tester Flex Abrasion

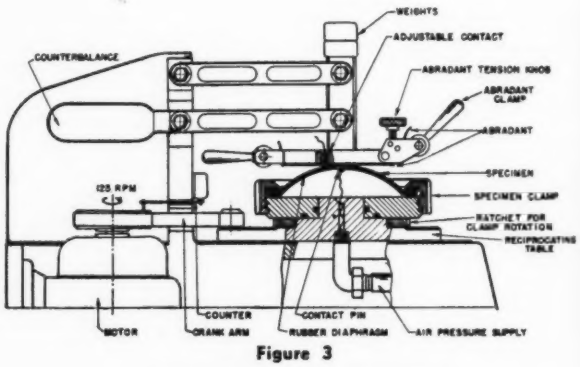


Figure 3

Diagram of Stoll-Quartermaster Universal Wear Tester Surface Abrasion

TABLE I
FLEX ABRASION DATA OF FOUR NONWOVEN FABRICS TESTED UNDER DIFFERENT CONDITIONS

	Number of cycles to rupture											
	V-C-65-0			K-1182			P-5-368			M-840-B013		
Specimen	a	b	c	a	b	c	a	b	c	a	b	c
1	57	737	187	60	505	285	54	321	140	29	254	Slides apart under the static load.
2	55	571	147	82	406	237	59	360	90	27	381	
3	48	1078	220	102	700	257	55	369	136	22	343	
4	66	677	160	69	526	275	59	469	113	31	400	
5	60	690	131	72	696	202	59	311	145	25	485	
6	59	571	212	67	513	236	64	425	131	21	387	
7	74	1038	149	100	593	251	53	304	112	26	349	
8	60	1030	157	159	617	208	73	363	160	25	455	
9	65	1225	159	65	562	186	49	356	150	27	469	
10	46	902	121	74	604	234	63	330	156	24	461	
$\bar{X}$	59	852	164	83	572	237	59	361	133	26	398	
δ	8.3	233	32.5	29.6	90.1	31.7	6.8	51.8	22.2	3.0	71.8	
V	14.1	27.3	19.8	34.8	15.7	13.4	11.5	14.4	16.7	11.7	18.0	

Test conditions: Flex abrasion, folding bar method; specimens 1 in wide cut with length direction parallel to the edge of the fabrics.
a—Flexing with 1/16 in carbide tipped square-edged bar, 4 lb load on bar, 2 lb head load, dry.
b—Flexing with 0.01 in rounded-edge blade, 4 lb load on bar, 2 lb head load, dry.
c—Flexing with 0.01 in rounded-edge blade, 4 lb load on bar, 2 lb head load, wet.

TEST METHODS

APPARATUS ——— A multipurpose abrasion tester suitable for evaluating the resistance of textile fabrics to various definite wear actions was described in a previous paper *(3)*. The original development model has recently been entirely redesigned and is now commercially available as the self-contained unit shown in Figure 1.* In general, this instrument permits evaluation of quantitative parameters for the resistance to surface abrasion, flex abrasion, roll and fold abrasion and abrasion on edges and projections. All of these tests may be made with the specimen dry or immersed in water, oil or other liquids. Automatic end points, which are provided for the various test procedures, secure reproducible and definite results independent of the judgment of the operator or the application of an additional test method. The apparatus can be used for the wear testing of a large variety of materials, such as woven and knitted fabrics, hosiery, yarns, thread and cordage, rubber and plastic sheeting, leather, paper, etc. In this paper, however, only the specific application to flex and surface abrasion testing of nonwoven fabrics will be covered.

FLEX ABRASION ——— The general method of making flex abrasion tests is indicated in Figure 2. A one-inch wide specimen strip is fastened in the forward clamp of the balanced head (upper specimen clamp) and then carried around the folding bar back to the clamp on the front side of the reciprocating table. This table moves back and forth for a stroke length of one inch, making 125 strokes per minute. The upper plate is attached to a double lever assembly, which permits free movement only in a direction perpendicular to the plane of the reciprocating plate. It is stationary during the test and maintains a controlled vertical pressure on the specimen folded around the bar. The folded specimen is held under controlled tension by applying to the folding bar a force parallel to the surface of the two plates and perpendicular to the fold of the specimen. The weights for the folding bar are allowed to drop upon rupture of the specimen, thus actuating the flex control switch, stopping the instrument and recording the number of cycles.

SURFACE ABRASION ——— The arrangement used to measure surface abrasion resistance is schematically shown in Figure 3. A circular specimen (4¼ inches in diameter) is mounted over a rubber diaphragm in the rotary specimen clamp, and then inflated by controlled air pressure. If the specimens are to be tested under wet conditions, they are clamped in dry and covered with approximately 10 ml water before they are inflated. The specimen clamp permits multidirectional surface abrasion by a simultaneous reciprocating and rotary motion, completing 125 strokes per minute and two full rotations in 105 strokes. The rotating mechanism of the specimen clamp can be disengaged to permit the performance of unidirectional surface abrasion in any direction relative to the fabric structure.* The abrasive paper or any other suitable abradant is placed on the balanced abradant head so that the adjustable contact pin reaches through a hole cut in the abradant and is flush with the abrasive surface. The end point of the test is reached when all fibers in the center of the abrasion area are worn off so that the pin in the abradant head contacts that in the diaphragm, actuating the stop switch of the machine.

EXPERIMENTS

MATERIALS ——— Four plastic-bonded fiber webs were tested to demonstrate the specific conditions found suitable for determining resistance to surface and flex abrasion and to illustrate in general the above-described concept of laboratory wear testing of nonwoven fabrics.

The four samples differed in structure and weight as indicated in Figure 4.

TEST PROCEDURES———In testing the resistance to flex abrasion of the four samples, two different folding bars (Figure 5) were used. The square-edged bar was 1/16" x ⅜" in cross section with cemented carbide edges on the side that rubs against the specimen. The rounded-edge blade made of stainless steel was 0.01 x 1.00 inch in cross section and its rounded edge was polished. All tests were performed with loads of one pound on the head and four pounds on the folding bar or blade. These weights have been found suitable for most medium-weight woven and nonwoven fabrics. Other loads may be applied, however, in accordance with specific material requirements. In the wet test, the center portion of the specimen was immersed in water at a temperature of 70°F for approximately 10 minutes. The wet specimen was then clamped into the machine and an additional 1 ml water was placed around the fold of the specimen.

In the surface abrasion test, an air pressure of 4 psi was applied to inflate diaphragm and specimen. Emery 0 abrasive

* Manufactured by Custom Scientific Instruments Company, Inc, Arlington, New Jersey.

* A few preliminary unidirectional tests on nonwoven fabrics were made which indicated clearly a difference in abrasion resistance depending on the fiber orientation of the webs.

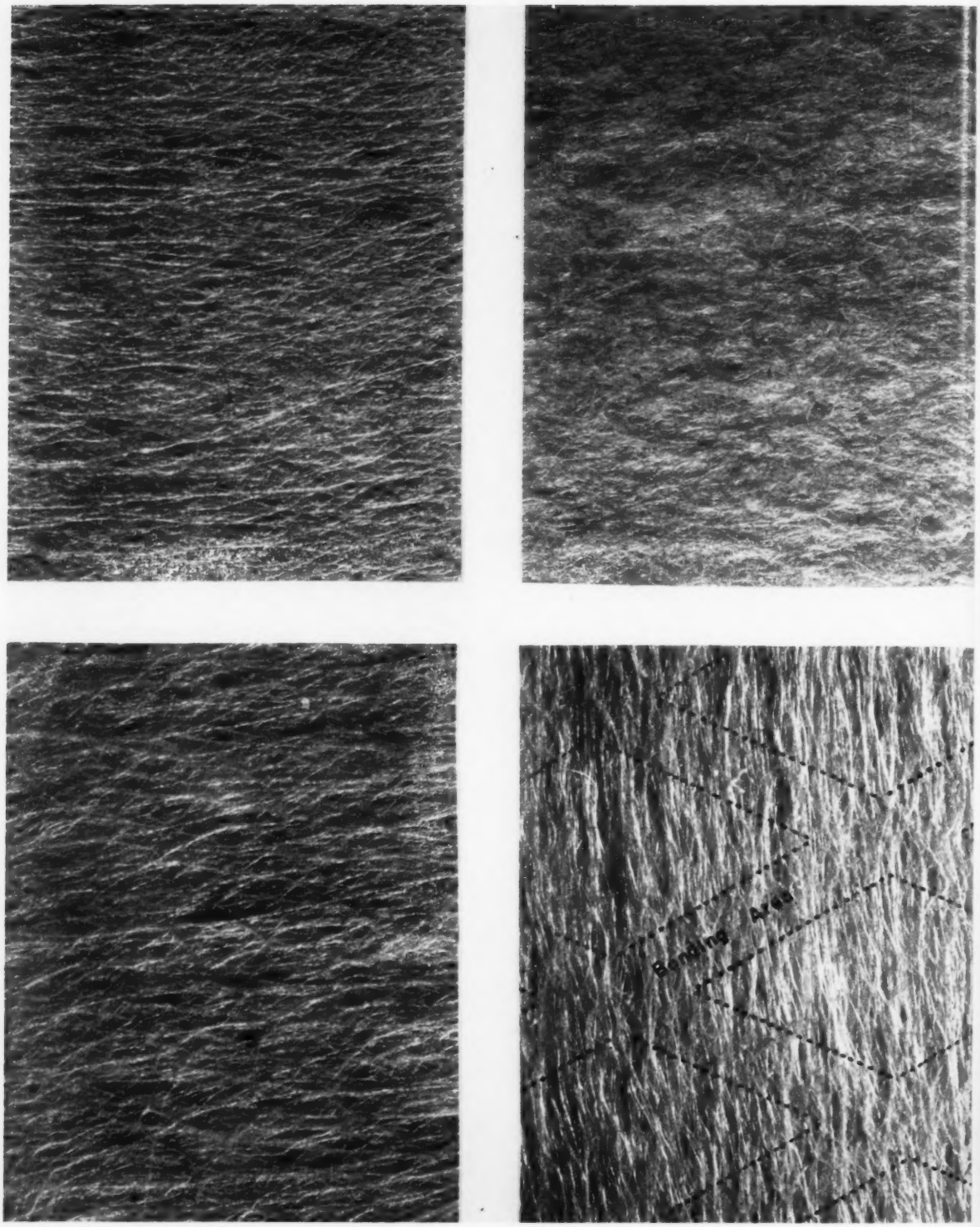


Figure 4

Upper Left—VC-650, 1.6-oz Continuous Bonding
Upper Right—K-1182, 2.6-oz Continuous Bonding
Lower Left—P-5-368, 2.3-oz Continuous Bonding
Lower Right—M-840-BO 13, 2-oz Noncontinuous Bonding

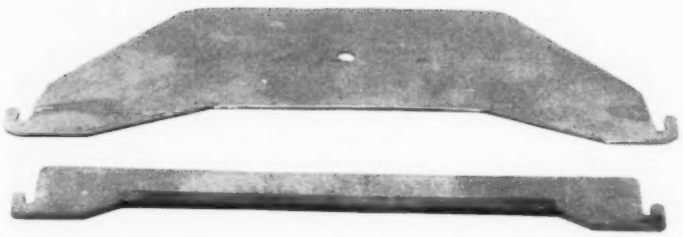


Figure 5

Round-Edge Blade and Square-Edged Bar Used in Flex-Abrasion Tests

TABLE II

SURFACE ABRASION DATA OF FOUR NONWOVEN FABRICS TESTED UNDER DRY AND WET CONDITIONS

	Number of cycles to reach end point							
	V-C-65-0		*K-1182*		*P-5-368*		*M-840-B013*	
Specimen	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*
1	242	24	173	47	78	38	122	11
2	189	29	155	40	117	37	120	14
3	214	22	230	39	66	41	141	14
4	163	30	142	38	80	46	145	
5	212	22	155	30	85	42	107	
6	179	20	124	43	76	44	136	
7	164	28	226	46	93	43	68	
8	191	26	168	44	189	57	102	
9	165	27	195	37	58	45	92	
10	185	23	172	43	107	35	112	
X	190	25	174	41	95	43	115	13
6	25.7	3.4	34.3	5.0	37.5	6.1	23.7	..
V	13.5	13.4	19.7	12.4	39.5	14.3	20.6	..

Test Conditions: Surface abrasion, diaphragm method; 4 lb/sq in air pressure; 1 lb head load; Emery 0 abrasive paper (for dry tests); silicone carbide paper No 600 (for wet tests); standard atmospheric conditions; specimens $4\frac{1}{4}$ in in diameter.

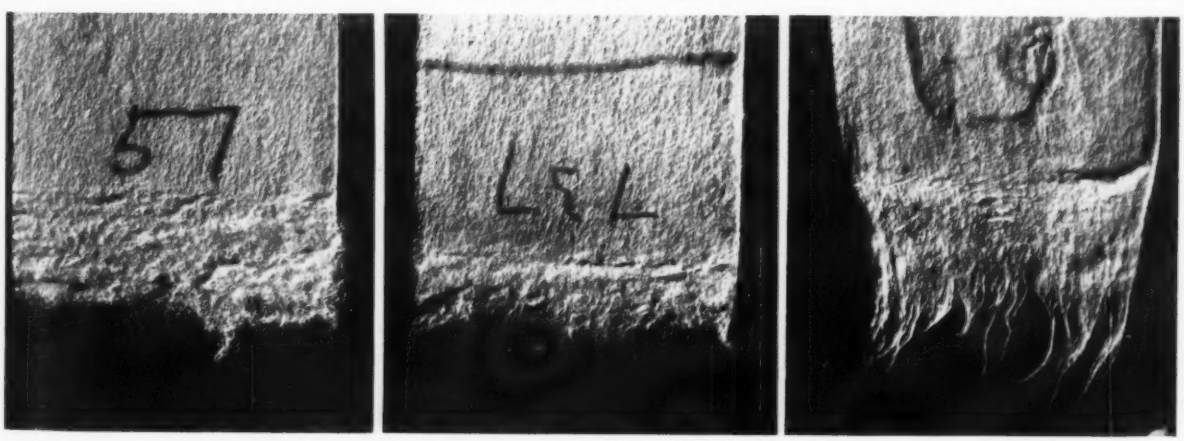
paper was used for the dry test and silicone carbide waterproof paper No 600 for the wet test. In both cases the abradant head was weighted with a one-pound load. Pills of matted fibers were removed from the abrasion area when they caused a marked vibration of the abradant head.

Standard atmospheric conditions were maintained during the tests. For the determination of the three flex-abrasion and two surface-abrasion characteristics, 10 specimens of each sample were measured.

RESULTS ——— The individual data obtained, the mean values ($\bar{X}$), standard deviations (6) and coefficients o fvariation (V) are compiled in Table I for flex abrasion and Table II for surface abrasion.

The wear patterns obtained in the three types of flex tests are illustrated in Figure 6, showing three ruptured specimens from Sample V-C-65-0, one tested dry with the square-edged bar (Figure 6A), the second also tested dry, but with the rounded-edge blade (Figure 6B) and the third tested wet with the rounded-edge blade (Figure 6C). In the specimens abraded dry, breakdown of the material is caused primarily by a cracking of the individual fibers. In sample M-840-B013, which was not continuously bonded, the proportion of fiber slippage was somewhat higher than in the other three samples. In Figure 6C it can be readily seen that the wet abrasion caused only a few fibers to be cracked by the flexing and bending stresses; the ultimate rupture was the result of a gradual breakdown of the bonding and a separation of the structure by fiber slippage.

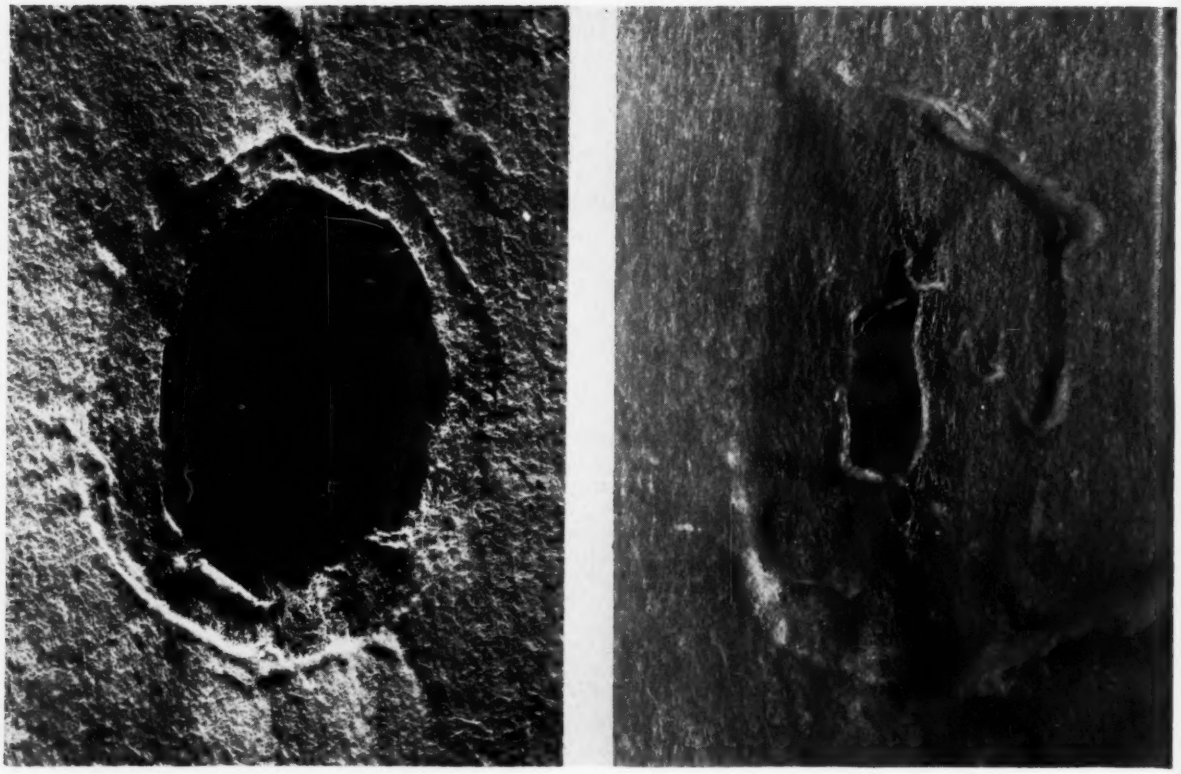
The wear pattern obtained in surface abrasion at the automatic end point is illustrated in Figure 7A for the dry test and in Figure 7B for the wet test.



Square-Edged Bar Dry **Rounded-Edge Blade Dry** **Rounded-Edge Blade Wet**

Figure 6

Examples of Flex-Abrasion Specimens



A. Dry B. Wet

Figure 7

Examples of Surface-Abraded Specimens

DISCUSSION

On the basis of an analysis of variance of the data shown in Tables I and II, it was found that on a 5 per cent significance level the critical differences among the mean values is from 6 to 10 per cent of the grand average of each characteristic. This means that the differences between the fabrics must be at least this great to be significant.

An index for the over-all resistance to laboratory wear was obtained for each sample by relating the sample mean for each of the five characteristics to the corresponding grand average of the characteristic and averaging these relative values. These indices, together with the average values of the five laboratory wear characteristics, and their critical differences, are compiled in Table III.

The data in Table III and the diagram in Figure 8 indicate that the different wear characteristics of the four materials are not associated by a simple linear relationship. They also show that resistance to the various laboratory wear actions is not directly related to the weight of the samples.

The flex-abrasion resistance of Nos K-1182 and P-5-368 was affected much less by the presence of water than was No M-840-B013. The noncontinuous bonding of the web of No M-840-B013 is responsible for its relatively good flex-abrasion resistance in the dry state and low resistance in the wet state. However, in general the reaction of the four samples to the five different laboratory wear actions was not so conflicting that a rating for their over-all resistance to complex wear actions could not be assigned. The relative over-all resistance as shown in Table III may therefore be considered as valid for most applications.

It might be noted (see Figure 8) that of the single characteristics the flex-abrasion resistance of the wet structures determined with the rounded-edge flexing blade and of the dry fabrics determined with the square-edged bar correlate best with the over-all resistance.

It must be realized that the experimental error as indicated by the variations within the samples does not reflect directly the precision of the machine or method. This variation is the complex result of variations within the sample material itself and of errors due to the ma-

TABLE III

AVERAGE LABORATORY WEAR DATA OF FOUR NONWOVEN FABRICS

Sample Description		Flex-Abrasion Cycles			Surface-Abrasion Cycles		Relative Over-all Resistance
Code	Os / Sq Yd	Dry Square Edge	Dry Round Edge	Wet Round Edge	Dry	Wet	
V-C-65-0	1.6	59	852	164	190	25	119
K-1182	2.6	85	572	237	174	41	138
P-5-368	2.3	59	361	133	95	43	95
M-840-B013	2.0	26	398	1	115	13	48
	$\bar{X}$	57.2	546.2	133.7	143.5	30.5	100
Critical difference		4	38	9	10	3	

chine-operator-test condition combination. The data presented in Tables I and II do not permit isolation of these various sources of variation on a strictly statistical basis. However, it has been found that the coefficients of variation of surface and flex abrasion data, when determined on homogeneous films under the same conditions as observed in these experiments, are as low as 4 to 5 per cent. It can therefore be assumed that the basic error variation shown in Tables I and II is primarily due to the variation within the samples under the given test conditions. On the basis of this consideration, the variation of the data not only indicates the statistical significance of the mean values but also characterizes the uniformity of the samples with respect to wear resistance. The technical importance of a coefficient characterizing the unevenness of the material needs no further explanation. Instead of dealing with the individual V values, which are subject to a relative high error by chance, it is advisable to express the uniformity by an unevenness index calculated by the following equation:

$$\text{Unevenness index} = \sqrt{\frac{V_1^2 + V_2^2 + \ldots . V_n^2}{n}} - 5$$

where the V's are the coefficients of variation of the measured laboratory wear characteristics and the number 5 accounts for the inherent variability of the method as determined on a homogeneous material. The data thus obtained for the unevenness of the four samples with respect to the five laboratory wear actions tested are shown in Table IV.

Since the wear life of a material under given wear actions depends primarily on the amplitude and frequency of the weakest links, it is advisable to calculate and compare values which correspond with the lower limit of a given probability rather than to base the quality comparison on the average resistance data. The following formula is obtained for the calculation of a lower relative resistance if one assumes that the unevenness within the samples is of normal distribution and that the unevenness coefficient shown in Table IV is representative for all five wear characteristics tested:

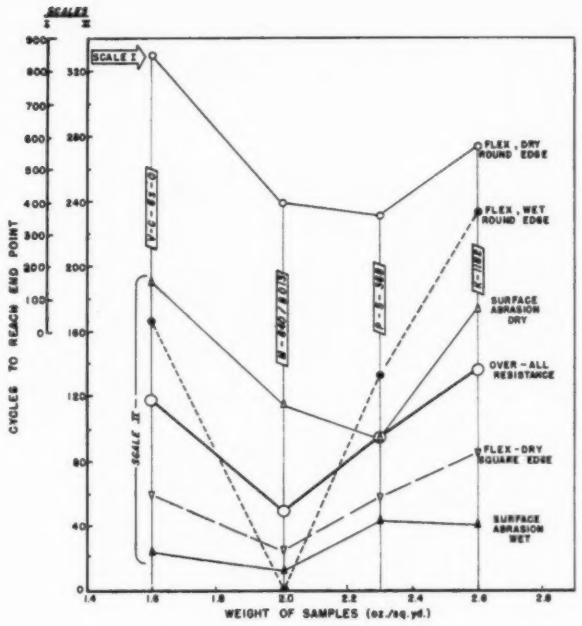


Figure 8

Interrelationship between Laboratory Wear Data and Weight of Samples

$$\text{Lower relative over-all resistance} = \left(\text{Average relative over-all resistance}\right) \times \left(1 - \frac{2 \times \text{unevenness coefficient}}{100}\right)$$

The data obtained with this equation are also shown in Table IV.

Due to the large differences in the average over-all resistance and the relatively small variation of the unevenness coefficient, the lower relative over-all resistance does not rank the samples differently from the average relative over-all resistance. However, it can be seen that the quality difference between Samples V-C-65-0 and K-1182 is not as great on the basis of the lower relative over-all resistance as it is on the basis of the average relative over-all resistance.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to Fred K Quigley, Jr, Plastics Division, The Dow Chemical Company, who supplied the samples and provided the stimulus for this study on behalf of the AATCC and ASTM committees on nonwoven fabrics; and to the following individuals of the Quartermaster Research and Development Laboratories, Philadelphia Quartermaster Depot: Mrs Georgette Kelly for carrying out the laboratory experiments, Dr Walter Gailus and Gerald Winston, who offered many helpful comments and Norman E Roberts, who carefully edited this paper. Gratitude is also expressed to Custom Scientific Instruments, Inc, which made available the machine used for testing the samples.

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TABLE IV

LOWER RELATIVE OVER-ALL RESISTANCE OF FOUR NONWOVEN FABRICS BASED ON AVERAGE OVER-ALL VALUES AND UNEVENNESS COEFFICIENTS

Sample	*Average Relative Over-all Resistance*	*Unevenness Coefficient*	*Lower Relative Over-all Resistance*
V-C-65-0	119	13.4	87
K-1182	138	15.8	94
P-5-368	95	16.8	63
M-840-B013	48	12.2	36

CHEMICAL RESISTANCE OF NYLON*

MATERIALS HAVING NO PERMANENT EFFECT ON NYLON YARN

MOST compounds of the following general types have little or no effect on the tenacity and elongation of nylon yarn under ordinary conditions of exposure:

Alcohols
Aldehydes
Alkalis
Dry cleaning solvents
Ethers
Halogenated hydrocarbons
Hydrocarbons
Ketones
Soaps and synthetic detergents
Water, including sea water

In some actual tests nylon yarn, nylon bristle†, and nylon fish line samples were treated under the conditions given below. Strength measurements were made before exposure, and on the washed and dried sample after exposure. None of these treatments caused a significant loss in the strength of the samples.

1—Yarn sample in a 10% water solution of sodium hydroxide at 185° F for 16 hours.

2—Yarn sample in a 10% water solution of potassium hydroxide at 150° F for 3 hours.

3—Bristle sample in a 19% water solution of potassium carbonate at 77° F for 2 months.

4—Bristle sample in a 10% water solution of sodium cyanide at room temperature for 7 days.

—Fish line sample in Florida sea water for 4 weeks.

—Yarn sample in a 3% water solution of formic acid at 212° F for 3 hours. (*Concentrated* formic acid dissolves nylon.)

7—Yarn sample in a 3% water solution of acetic acid at 212° F for 3 hours.

8—Yarn sample in a 3% water solution of hydroxyacetic acid at 212° F for 3 hours.

9—Bristle sample in lard at 180° F for 5 days.

10—Bristle sample in cottonseed oil at 180° F for 5 days.

11—Yarn sample in dichlorodifluoromethane ("Freon-12" refrigerant) at room temperature for 8 days.

12—Yarn samples in methyl alcohol, ethyl alcohol, acetone, carbon tetrachloride, tetrachloroethylene ("Perclene" solvent), trichloroethylene ("Triclene" solvent), benzene, and Stoddard solvent at room temperature for 60 hours.

MATERIALS HAVING A PERMANENT EFFECT ON NYLON YARN

The following materials will dissolve nylon yarn at room temperature:

Concentrated formic acid. (The solubility falls off rapidly as the concentration of formic acid is decreased. 3% formic acid has substantially no effect on the yarn strength—see item 6 above.)

Phenolic compounds such as phenol (carbolic acid), cresols, xylenols, and chlorinated phenols.

Calcium chloride in methanol (saturated solution).

Some other solvents for nylon yarn are:

Benzyl alcohol at the boil.

Hot solutions of calcium chloride in (a) glacial acetic acid, (b) ethylene chlorhydrin, and (c) ethylene glycol.

Hot solutions of zinc chloride in methanol.

Concentrated nitric acid, concentrated sulfuric acid, and concentrated hydrochloric acid. (Apparently these agents dissolve the fiber by breaking down the molecular structure of the polymer.)

Hydrochloric acid and sulfuric acid in 3.0% concentrations at room temperature caused about 20% loss in strength of nylon yarn in 2 hours. Strength losses were also noted with lower concentrations of these acids. The rate of deterioration increased with the concentration and temperature.

Oxalic acid in 3.0% concentration at room temperature caused some deterioration of nylon yarn. The rate of deterioration increased rapidly with temperature. At 212° F about 35% loss in strength occurred in 3 hours.

Nylon yarn, like other textile fibers, is subject to some slight deterioration when treated with bleaches of the ordinary types. The degree of deterioration will depend on a number of factors among which are the type and concentration of the bleaching agents, the pH of the bleach bath, and the time and temperature of the treatment. Bleaching of nylon is discussed in the bulletin on "Bleaching."

Air (oxygen) at *high* temperatures will cause deterioration of nylon. This is discussed in the bulletin on "Heat Resistance and Related Properties."

Green 16 1) Bright, blue, weak
2) Dull, equal, strong
3) Bright, equal, strong

SWELLING AGENTS FOR NYLON YARN

A preliminary investigation of swelling agents for nylon yarn indicated that the agents listed below cause an appreciable increase in the diameter of nylon filaments. The effect of these agents on the strength of the yarn was not determined. No information is available for concentrations other than these listed.

20% formic acid in water
100% acetic acid
2% acetic acid in methanol
20% chloroacetic acid in water
100% lactic acid
Benzoic acid in water (saturated solution)
2% benzoic acid in methanol
20% parahydroxybenzoic acid in methanol
20% benzene sulfonic acid in water
2% adipic acid in methanol
Boric acid in methanol (saturated solution)
20% phosphoric acid in water
20% phosphoric acid in methanol
2% phenol in water
2% metacresol in water
2% metacresol in methanol
100% glycol
20% chloral hydrate in water
Lithium bromide in methanol (concentrated solution)
Zinc chloride in water (saturated solution)
Aniline in water (saturated solution)
100% ethylene chlorhydrin

† The nylon bristles were made from the same type of polymer used in nylon yarn.

* Reprinted from Nylon Technical Service Bulletin, 3.01-3.03, "Physical Chemical Properties," E I duPont de Nemours & Co, Inc.

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Calendar of Future Meetings

COUNCIL: June 26 (Hotel New Yorker, N Y); Oct 18 (Hotel Statler, N Y); Nov 16 (Hotel New Yorker); Jan 18, 1952, April 18, 1952, June 20, 1952, Sept 19, 1952 (all in New York); Nov 6, 1952 (Boston).

GENERAL RESEARCH COMMITTEE: (Same dates and sites as Council).

NATIONAL CONVENTIONS: 1951—October 17-19, Hotel Statler, New York, N Y; 1952—November 6-8, Boston, Mass; 1953—Sept 17-19, Hotel Stevens, Chicago, Ill; 1954—Atlanta, Ga.

HUDSON-MOHAWK SECTION: June 22 (Annual Outing, Wolfert's Roost Country Club, Albany, N Y); Sept 21 (Jack's Restaurant, Albany); Oct 26 (Hotel Utica, Utica, N Y); Dec 7, Feb 1, 1952, Mar 21, 1952, May 2, 1952 (all at Jack's Restaurant); June 20, 1952 (Annual Outing).

MID-WEST SECTION: June 16 (Outing, Lake Lawn Lodge, Delavan, Wis); Sept 29 (Morrison Hotel, Chicago, Ill).

NEW YORK SECTION: May 17 (Swiss Chalet, Rochelle Park, N J); June 15 (Outing, North Jersey C C, Wayne Twsp, N J).

NORTHERN NEW ENGLAND SECTION: May 18 (Andover C C, Andover, Mass); June 8 (Outing, Merrimac V C C, Methuen); Oct 26 (LTI, Lowell, Mass); Nov 30 (Annual Meeting, Boston, Mass).

PHILADELPHIA SECTION: June 1 (Outing, Torresdale-Frankford C C); Sept 14, Oct 26, Dec 7, Jan 18, 1952 (all at Kugler's Restaurant, Philadelphia).

PIEDMONT SECTION: June 29-30 (Outing, Myrtle Beach, S C); Sept 22 (Annual Meeting, Charlotte, N C).

RHODE ISLAND SECTION: May 25 (Johnson's Grill, Providence); June 22 (Outing, Wannamoisett C C); Oct 26 (Providence Engineering Society); Nov 16 (Johnson's).

SOUTH CENTRAL SECTION: August 24-25 (Outing); Dec 1 (Hotel Patten).

SOUTHEASTERN SECTION: June 8-9 (Outing, Radium Springs, Albany, Ga); Sept 8 (Columbus, Ga); Dec 8 (La Grange, Ga).

WESTERN NEW ENGLAND SECTION: June 22 (Outing).

Raymond W Jacoby

JACOBY NAMED 1951 OLNEY MEDALIST

RAYMOND W JACOBY of Ciba Company, Inc, assistant general chairman of the 1950 AATCC Convention, has been selected as the Olney Medalist for 1951, according to an announcement made by National President C Norris Rabold before the Piedmont Section on April 21. Mr Jacoby, who will be the seventh Olney Medal winner, was the unanimous choice of the five-man Olney Medal Award Committee.

The award will be presented in October at the 30th National Convention in New York.

Piedmont Section Meeting Report

April 21, 1951
Raleigh, North Carolina

THE Spring meeting of the Piedmont Section, scheduled to coincide with the National Council and Research Committee meetings of the two days previous, was held in Raleigh, North Carolina, on April 21.

Many important committee meetings were held on April 19 at the Hotel Sir Walter as follows:

10:00 am—Vat Monograph Committee—R W Jacoby, *Chairman*

12:30 pm—Conventions Committee—K H Barnard, *Chairman*

2:00 pm—Publications Committee—Percival Theel, *Chairman*

3-5 pm—Durable Finishes Committee—A D Nute, *Chairman*

C Norris Rabold, National President, presided over the Council meeting on Friday, April 20th and Leonard S Little presided over the meeting of the General Research Committee. Both meetings were held at North Carolina State College. The Executive Committee on Research met at the Hotel Sir Walter with Chairman Little presiding.

The Piedmont Section's Research Committee met at North Carolina State College's School of Textiles with Dr H Y Jennings, chairman, presiding.

LUNCHEON

There were several developments at the luncheon meeting of Section officers and committeemen. William D Livingston was given complete charge of arrangements of the Summer Outing, to be held June 29-30 at the Ocean Forest Hotel. Edwin A Briggs, Section chairman, appointed M M McCann secretary pro tem to carry on in place of C C Cobb during his absence from the U S. It was voted to assess a $1 extra for registration of nonmembers attending the Piedmont Section banquets starting with the meeting in Charlotte, September 22, 1951. (J Leon Moore, Charlotte, North Carolina, is Chairman of the Charlotte meeting and will have complete charge of all arrangements.) It was voted to make the September 22nd meeting a past chairman's reunion at which time plaques will be awarded to all past chairmen. These will be awarded to those in attendance and to the next of kin of those past chairmen now deceased. It was announced that the National Meeting for 1954 will be held in Atlanta, Georgia with Russell Gill and A K Haynes as co-chairmen.

AFTERNOON SESSION

The afternoon session, at which the Student Intersectional Technical Paper Contest was conducted, was presided over by Mr McCann, Contest Committee Chairman. He introduced Billy G Estes, president of the host chapter, Clemson College.

C Frank Donyes of Los Angeles, Calif, a North Carolina State Senior, won first prize ($40 worth of books) for his paper "Textile Applications of Infrared Photography." Mr Donyes will have an expense-paid trip to New York to present his paper at the National Convention in October.

The second prize ($30 worth of books) went to John R Mauney, Jr of Shelby, N C and Gerald L McRee of Charlotte, N C, co-authors of the paper "Effect of Residual Processing Chemicals on Cotton During Storage."

Other papers included: "A Comparison of Methods for the Determination of the Percent Starch of Cotton Goods" by Charles E Coleman and Billy G Estes of Clemson College; "Mechanical Aspects of Color Matching" by Melbourne G Michaels and Walter L Thompson, also of Clemson; and "The Dyeing of Blends" by Alen D Nacht, Stanley D Bulbin, Joseph E Bresnahan, George Fisk, William H Muse, and Benjamin L Powers, all of Georgia Tech.

The panel of judges included Linton Reynolds, *chief justice*, A K Haynes, Gillespie Smith, J C King, Carl Wilcoxon, Hobart Souther and Charles Ordway.

EVENING SESSION

The evening banquet, at which Mr Briggs presided, featured W E Debnam, noted radio commentator, speaker, and author. The affair was a sellout, with a large number of late arrivals being turned away. National President Norris Rabold revealed at this session that Raymond W Jacoby of the Ciba Company, Providence, R I, had been selected as the 1951 Olney Medalist.

Jack Jordan, Wiscassett Mills, was in complete charge of the meeting arrangements. He was assisted by Henry A Rutherford, Section Councilor and head of N C State's Textile Chemistry and Dyeing Department, and other faculty members and students of the school's Textile Department.

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Council and Research Committee Meeting Date Changed

THE meetings of the Council and Research Committee, originally scheduled for June 15th at the Hotel New Yorker, New York City, have been changed to Tuesday, June 26th at the same hotel. Sub-committee meetings scheduled for June 14th will now be held on Monday, June 25th.

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1952 Meeting Dates of Council and Research Committee

THE following dates have been tentatively selected for meetings of the Council and Research Committee during 1952.

January 18—New York
April 18—New York
June 20—New York
September 19—New York
November 6—Boston

Southeastern Section——

CONTEMPORARY VAT-DYEING PRACTICE*

ORMOND W CLARK

Calco Chemical Division, American Cyanamid Company

Ormond W Clark

A vat-dye demonstrator reviews vat dyeing from the practical point of view, covering especially the latest developments in the continuous dyeing of both cloth and chain warps, as well as certain phases of package dyeing. At the same time he discusses the relation of the various parts of different continuous-dyeing equipment to continuous-dyeing procedures.

Typical examples and recipes are given for the application of vat dyes continuously by the Dan River, Williams, padsteam and Electrofixierer methods. The new Standfast Molten-Metal and Williams-Oil methods for vat-leuco fixation are described.

For the dyeing of cotton chain warps, the advantage of the Calcotherm procedure for improvement of leuco stability is suggested. The Unistel-Batchelder machine for dyeing and slashing continuously is mentioned.

In the field of package dyeing, the conventional methods of pigment circulation before reduction are given and the advantage of the Calcotherm modification is explained.

INTRODUCTION

THIS paper presents a brief survey of some of the vat-dyeing procedures and equipment which are of particular interest to contemporary production dyers. To as large an extent as possible, the material is based on the practical experience of the writer in the United States and Canada as a technical-service representative for a dye manufacturer. Despite eighteen years of experience as a production dyer and twelve years of service work throughout the United States and Canada, there are altogether too many subjects in the dyeing field about which the writer cannot speak dogmatically because accurate scientific evaluation has not resolved the viewpoints of differing schools of thought. However, the production dyer, expert as he is in the application of processes of a particular plant, is usually interested in hearing the experiences and opinions of his contemporaries, especially with respect to new developments.

Three fields of vat-dye application are included in this discussion: continuous processes for dyeing cloth, continuous processes for warp dyeing and certain phases of package dyeing.

I. CONTINUOUS PROCESSES FOR DYEING CLOTH

This section discusses the following factors:

(a) Padders and padding

(b) Processes using large-volume, high-temperature, liquid-reduction baths.

(c) Processes using a steam atmosphere to actuate reduction and fixation.

(d) Processes using a molten-metal bath to actuate reduction and fixation.

PIGMENT PADDING—Pigment padding is so widely used in modern continuous-range dyeing that it will be discussed in some detail. Although padding seems to be a simple operation, practical dyers can testify to vexatious experiences, and therefore a review of factors involved in padding, and some conclusions engendered by work in various dyehouses may be of interest.

PICKUP—There are three actions that should undoubtedly be considered in padding, but about one of these, the effect of the hydraulic and mechanical forces at the padder nip, little is accurately known. For the purposes of this discussion, padding is considered as made up of two steps: sorption of dye liquor from the dyebath in the trough, and extraction of surplus liquor by the squeeze rolls. The *net effect* of these two actions is called "pickup". An article in the February 21, 1949, issue of the *American Dyestuff Reporter*, "A Preliminary Study of Variables in Padding", discusses pickup in detail, and a brief summary of certain factors pertinent to this present discussion is repeated here with specific reference to *well-prepared cotton* and to *average viscose fabrics*.

Pickup decreases as the temperature of the dyebath is increased from 80 to 200° F, if a wetting agent is added to the dyebath, and as the nip pressure is increased.

Pickup usually increases as the padding speed is increased.

The following comparison illustrates the marked difference in behavior of two fabrics of quite different constructions:

With kier-boiled and bleached, 68 x 40, 2.50-yard cotton twill, for example, an increase in dyebath temperature from 140 to 200° F and a simultaneous increase in pressure from 6 to 12 tons on a certain 60" padder decreased the pickup from 70 to 55%. About 1/3 of the change was due to the variation in temperature and about 2/3 was due to the variation in pressure.

With mrecerized, 80 x 80 cotton cloth, an increase in temperature from 140 to 200° F and a simultaneous increase in pressure from 6 to 12 tons on the same padder decreased the pickup from 55 to

* Presented at Talladega, Alabama, before the Southeastern Section on February 24, 1951.

50%. Each factor caused about ½ of the change.

PADDER ROLLS—Practically all of the liquor removed by the squeeze rolls is that which is loosely held on the surface of the cloth, yarn, and fibers. The effective force in removing this liquor is the pressure in pounds per square inch of nip area, and, for any specific padder loading, this force is greatest for relatively hard rolls and a narrow nip. However, the aim in padding is not only removal of surplus dye liquor, but also the uniform distribution of dye throughout the fabric. Hard rolls and a narrow nip fail in this latter respect, although they may be very desirable where the only requirement is maximum liquor extraction.

PADDER CONSTRUCTION—One of the most troublesome problems in present dyehouse operation is the production of dyeings that are not shaded side to side, side to center, or back to face. Padder rolls that are too hard are a major contributor to these faults.

To secure both uniform dye distribution and adequate removal of excess liquor, a relatively soft roll at each nip and high applied pressure is required. The rubber-roll manufacturer considers that a P & J Plastometer density of 40 to 50 represents a good compromise between density and durability. Some mill men believe that a softer roll with a P & J Plastometer density of 50 to 60 or even 60 to 70 is necessary to produce well-penetrated dyeings with a smooth surface appearance. Since rolls with a true cylindrical contour develop less pounds per square inch in the center of the nip than at the ends, it is general practice to grind padder rolls with a barrel crown in the center so that the circumference at the center of the roll is greater than at the ends. The amount of crown required depends upon several factors: the density of the roll, the length of the roll, the diameter of the roll, the load applied to the rolls and the construction of the cloth to be padded. For many of the usual types of padder operation on 50" to 60" padders with 18" to 20"-diameter rolls operating at about 10 tons pressure, crowns of 1/64" to 1/16" on the circumference usually give good results; and, if prior experience does not exist, a 1/32" crown is usually tried first. Rubber-roll manufacturers, as a general rule, do not cover rolls operating under heavy loading with more than a 1" thickness of rubber lest there be too great danger of the covering tearing or shearing off the core, and rolls should be recovered when the covering reaches a thickness of about ⅝".

PADDER PRESSURE—Increase in padder loading increases the dye penetration and uniformity of dye distribution and decreases the pickup. Excessive loading increases roll and bearing wear, increases power consumption, and does not produce commensurate increase in dye penetration and decrease in pickup. Suitable padder pressures for the usual 60-inch padders with 18" to 20"-diameter rolls range between 6 and 10 tons; pressures in excess of 10 tons are of questionable advantage.

PADDER TYPES—A good padder has a massive frame; massive and *rigid* roll cores, preferably of cast iron and 20 or more inches in diameter; linkages, bearings, and sliding ways, which are free from back lash and play; and a positive and accurate means of applying pressure. There is considerable controversy as to the comparative merits of dead-set, lever-set, pneumatic-set, and spring-set loading, and, in spite of the theoretical advantages of the three latter types, many experienced dyers prefer the dead-set type because of its simplicity. In the operation of any type of padder there is at present no other reliable way of checking cross shading than by examining sew-up patches at frequent intervals and correcting the padder set according to the indications of these patches. A flaw in present commercial padder construction is the inability to make slight adjustments of the set with sufficient precision. Some mills build their own padder or rebuild commercial padders so that more delicate adjustment of set is possible and so that better reproducibility of set can be obtained each time the padder rolls are reloaded.

While some mills state their inability to pad satisfactorily unless all rolls are rubber covered, other mills operate just as satisfactorily with only one rubber-covered roll per padder and the rest of stainless steel. Maximum use of stainless steel simplifies cleaning and maintenance.

From the aspect of the padding operation, heavy well-constructed padders, set adjustments amenable to accurate control, rolls of correct density and crown, and frequent examination of sew-up patches bring the side-shading problem under acceptable control. Even though the wet padded cloth is perfectly uniform, shading or blotchy dyeings can still be caused during drying of the pigment-padded cloth.

DRYING PIGMENT-PADDED CLOTH—The drying of pigment-padded cloth is usually carried out in roller hot flues, the earlier models of which caused much grief because they did not distribute the heat and air correctly. Although present models of experienced manufacturers avoid early mistakes, it is essential that screens, nozzles and ducts be kept scrupulously clean so that heat and air flow follow the designed paths and are not diverted to cause dye migration and so that dye specks do not result from accumulations of dust or lint.

PADDER TROUGHS—Padder troughs of very small volume have two advantages: the liquor turnover is rapid, minimizing scum formation, etc, and there is little liquor left at the end of a run. If the trough is jacketed, the top of the jacket must be well below the minimum liquor level to prevent liquor and foam from drying out and falling back into the dyebath during variations in level. Also, too high a jacket temperature may bake solids out on the walls and cause trouble. Foam guards are customary. It is advisable to strain the dye entering the padder spray pipe through a cloth strainer of large area. Automatic level controls and automatic temperature controls facilitate the maintenance of uniform shades.

DYEBATH FORMULATIONS—A correctly formulated dyebath wets the cloth very rapidly, does not adversely affect dye dispersion or chemical solutions, and keeps the surface of the bath scum-free. Careful attention should be given to the effect of assistants that are used in the dyebath. This is particularly true for very highly dispersed vat dyes.

CONTINUOUS VAT-DYEING PROCESSES FOR CLOTH—Recognition by the dyeing industry of the tremendous increase in rate of reaction brought about as temperature is increased forms the basis of modern continuous-dyeing processes. High-speed continuous processes for the reduction and fixation of vat dyes that are applied to cloth by pigment padding depend upon elevated temperatures to accelerate reduction. The fastness of dyeings made from a leuco solution is increased by immediately passing the cloth through a high-temperature reduction process. Three methods of high-temperature reduction are in commercial use, and a fourth has just been announced.

METHOD 1—Padded cloth is passed through one or more large-volume reduction baths at temperatures ranging up to 212° F. These baths vary from a minimum of 65 gallons in a single Williams unit to several hundred gallons in booster boxes or multidip padders. The most highly publicized, although not necessarily the only methods of this type, are the Dan River and the Williams processes.

METHOD 2—Padded cloth is padded through a cold small-volume reduction bath in which very little reduction and dyeing occurs, and then is passed into

a steam atmosphere for reduction and fixation. Methods of this type are the German Elektrofixierer and the U S pad-steam processes.

METHOD 3—Padded cloth is passed through an extremely small-volume reduction bath supported on top of the entrance end of a U tube filled with a molten-metal alloy at a temperature of 200 to 250° F, and reduction takes place while the cloth travels through the metal bath. Cloth can also be dyed solely by use of the metal bath and a leuco solution on top of the entrance end. Examples of this molten-metal method are a process developed in Germany by Nestellberger before World War II and the patented Standfast process of a British Co, Morton Sundour Fabrics, Ltd.

METHOD 4—The Williams unit is filled with a fluid, such as mineral oil, which is immiscible with water, and procedures are used that are analogous to those used in the Standfast process.

PROCESSES USING LARGE-VOLUME REDUCTION BATHS

All methods that employ large-volume solutions of caustic soda and hydrosulfite at high temperatures are troubled by leuco instability *(1)*, by the varying affinities of many vat dyes and by the effect of the leader on the bath in the running of trial patches or in the start of a run. The establishment of a new shade and the maintenance of a uniform shade throughout a long run, especially during early experience with these processes, require great skill, patience, and close supervision. Through painful experience, dyers have learned that several problems arise in the operation of the Dan River method and Williams units.

PROBLEM 1—In so far as possible, dyes of good leuco stability must be used. Since many important dyes lack perfect leuco stability, various dodges are used to avoid problems arising from leuco instability, as follows:

(a) The temperature in the bath is dropped to the safe maximum, and the cloth speed is lowered to allow sufficient reduction time, which of course also decreases production efficiency.

(b) The bath is overflowed at a rate of 100 to 200 gallons per hour in an effort to eliminate deteriorated dye. This expedient increases dye and chemical costs.

(c) Stabilizing chemicals are added: (1) Certain types of white corn dextrine are added in concentrations of 1½ to 5 oz per gallon of bath. Since the effect of the dextrine is rapidly destroyed in the presence of caustic soda, it must be added as a separate feed from the caustic, and large amounts are necessary in order that sufficient active dextrine be present. At temperatures above 180° F, the use of dextrine is not very advantageous in practice, but between 140 and 180° F, it is of assistance with a few dyes, particularly anthraqinone vat blues. If a bath stands idle more than about 5 minutes during patching, etc, it goes "dead" as expressed in dyehouse vernacular, and a fresh bath must be prepared. The frequent dissolving of large amounts of dextrine is an onerous task.

Certain other chemicals, of which one, sodium nitrite, has been used in practical runs, stabilize certain dyes, such as the anthraquinone vat blues, at temperatures as high as 200°F. Sodium nitrite is easy to dissolve; in practical operation concentrations of ¼ to 1 ounce per gallon are effective, and it can be fed with the caustic soda. However, under certain conditions it accelerates hydrosulfite consumption, and this has militated against its general adoption.

(d) In another procedure for avoiding trouble from leuco instability, shades are padded by the reduced method and then rereduced at the safe maximum temperature. Very little dye bleeds into the booster from reduced pads and, also, since the dye on the cloth is already reduced, high booster temperatures are not required, in contrast to pigment-padded cloth. However, leuco-padded cloth rarely looks as good as pigment-padded cloth, and the depth of shade is restricted by the solubility of the leuco compounds.

(e) If cloth is padded through a vat-acid dispersion, then the fixation process can be carried out at normal temperatures and problems of leuco instability are thereby minimized. Cloth dyed in this manner has an excellent appearance, but the process is somewhat complicated and the depth of shade is limited by the solubility of the sodium leuco compound of the vat dye.

(f) At times a dye that does not exhibit complete leuco stability is used at high temperatures. It may then be necessary to use a different dye in the booster than is used in the pigment padder in order to compensate for the shade change undergone by the original dye when it is reduced at a high temperature.

PROBLEM 2—In so far as possible, all dyes in a formula should exhaust similarly at the bath temperature. However, the equilibrium between dye on the entering cloth and dye in solution in the bath is complicated by the fact that most of the dye that comes off the cloth does so by a mechanical scouring action, and it dyes back through chemical affinity. It will be noted in the illustrative formula how different are the relative proportions of dye in the chemical bath and in the pigment bladder. In some laboratory V-box experiments at Calco *(2)*, it was found that cloth padded with a range of vat dyes required the following additions to the reduction bath for the establishment of equilibrium:

EQUILIBRIUM DYE CONCENTRATIONS
Milligrams per liter at 200° F

	Without salt	*With 16 oz salt per gal*
Vat Violet 4RP	100	...
Vat Jade Green	134	...
Vat Yellow GCD	167	...
Vat Gray 2G	334	...
Vat Violet BN Extra	750	...
Vat Brown R	1500	234
Vat Red BN	2000	250

In a study of initial exhaustion rates at Calco *(3)*, it was found that, for certain vat dyes, these rates were as follows:

INITIAL EXHAUSTION RATES
% per minute at 140° F

	Dye Conc 0.167 oz/gal	*Dye Conc 0.83 oz/gal*
Vat Violet 4RP	60	29
Vat Jade Green	47	33
Vat Violet BN Extra	46	31
Vat Yellow GCD	40	25
Vat Blue BLD	33	15
Vat Gray 2G	29	..
Vat Red BN	24	..
Vat Fast Yellow	15	..

PROBLEM 3—Leaders can produce annoying changes in reduction-bath concentrations by addition or subtraction of dye, and as a result trial patches will not correspond to the run, or the beginning of the run will not be the same shade as after a few hundred or even a thousand yards or more. Various methods have been tried to overcome this trouble, such as using leaders padded through water but not dried, using mercerized leaders, using narrow tapes, etc. One of the most satisfactory methods is to use a leader of a relatively nondyeing fiber, such as nylon. A nylon leader will last a month or more in constant use and can be used for various shades. It eliminates the large stock of cotton leaders in different shades which is otherwise necessary.

TYPICAL PROCESSES USING LARGE-VOLUME HIGH-TEMPERATURE CHEMICAL BATHS

DAN RIVER METHOD—In the Dan River process, cloth is padded through a pigment dispersion of vat dye and dried. It is then padded through a 350-gallon, 3-roll chemical pad at 140 to 200° F, and next may or may not be run through one or more large-volume booster boxes before rinsing, oxidation, and aftertreatment. For many shades, adequate fastness is secured by use of the chemical padder

alone. This process is operated at speeds up to 200 yards per minute.

An illustrative formula for a chemical padder without a booster is as follows:

PIGMENT PADDER, 150 yds/min

	oz/gal
Vat Gray 2G Double Paste	0.850
Vat Violet BN Extra Paste	0.735
Vat Brown R Double Paste	0.370

CHEMICAL PADDER, 350 gallons, 180°F

	oz/gal
Vat Gray 2G Double Paste	0.016
Vat Violet BN Extra Paste	0.009
Vat Brown R Double Paste	0.027
Caustic soda	1.0
Sodium hydrosulfite	0.75

An illustrative formula for a chemical padder and a 1300-gallon booster is as follows:

PIGMENT PADDER, 150 yds/min

	oz/gal
Vat Blue BLNS Double Paste	0.330
Vat Olive Green BN Double Paste	0.283
Vat Jade Green N Double Paste	0.685

CHEMICAL PADDER, 150 yds/min

	oz/gal
Vat Blue BLNB Double Paste	0.018
Vat Olive Green BN Double Paste	0.015
Vat Jade Green N Double Paste	0.027
Caustic soda	1.0
Sodium hydrosulfite	0.75

BOOSTER, 1300 gal, 120°F

	oz/gal
Vat Blue BLNS Double Paste	0.0062
Vat Olive Green BN Double Paste	0.0037
Vat Jade Green N Double Paste	0.0080
Caustic soda	0.75
Sodium hydrosulfite	0.30

THE WILLIAMS UNIT—Another procedure based on the use of high-temperature baths is carried out on the original Williams unit. In this patented device, the bath is contained in four very narrow chambers designed to minimize bath volume, to promote turbulence, and to cause and control extremely rapid circulation of the bath while its temperature is accurately maintained by thermostatically controlled steam jackets. The volume of one Williams unit for 60-inch material is about 72 gallons. Frequently two Williams units are connected in tandem in such a way that rapid interchange occurs between the baths of the two units. By the use of one or two units, and by variations in cloth speed and bath temperature, considerable flexibility in operation is possible.

ILLUSTRATIVE FORMULA I, COTTON POPLIN.

PIGMENT PADDER, 10 tons pressure, 60% pickup.

	oz/gal
Vat Blue BLNS Double Paste	2.60
Vat Olive T Paste	2.27
Vat Violet BN Extra Paste	1.10

Pad at 110 yards per minute, dry, reduce in 2 overflowing units.

EACH UNIT, 180° F

	Start	Feed/min to 2 Units
Caustic (dry)	12 lb	(1) 20 oz per 3 gal
Hydro	12 lb	(2) 16 oz dry feed
Dextrine	19 lb	(3) 12 oz per 1 gal
Pigment Pad Dye	½ gal	
Violet BN Extra	1 oz	

ILLUSTRATIVE FORMULA II, COTTON TWILL.

PIGMENT PADDER, 12 tons pressure, 55% pickup.

	oz/gal
Vat Olive T Single Paste	12.0
Vat Brown R Double Paste	1.0
Vat Khaki 2G Double Paste	0.8

Pad at 80 yards per minute, dry, reduce in 2 overflowing units.

EACH UNIT, 205° F

	Start	Feed/min to 2 Units
Caustic soda	30 lb	30 oz } per 3 gal
Hydro	15 lb	24 oz } per 3 gal
Salt	90 lb	48 oz } per 3 gal
Vat Olive T	1 lb 6 oz	..
Vat Brown R	8 oz	..
Vat Khaki 2G	2 oz	..

ILLUSTRATIVE FORMULA III, TAFFETA: Pigmented viscose warp and spun viscose filling. Without intermediate drying between padder and unit.

PIGMENT PADDER, 5 tons pressure, 85% pickup.

	oz/gal
Vat Brown BR Paste	0.88
Vat Gray 2G Double Paste	0.16

Pad and run, without intermediate drying, into a single unit, not overflowing, at 205°F and with 2 tons pressure on the unit nip, giving a pick-up of 105%. The differential between pad and unit pickups is 20%.

	Start	Feed/min to 1 Unit
Caustic soda	20 lb	
Hydro	20 lb	20 oz/1/3 gal
Salt	40 lb	5.5 oz dry feed
Vat Brown BR	11 oz	
Vat Gray 2G	1½ oz	

ILLUSTRATIVE FORMULA IV, VAT-ACID METHOD: Mercerized dobby broadcloth.

PIGMENT PADDER, 10 tons pressure, 60% pick-up. Reduce at 120°F.

	Pounds
Vat Blue BLNS Double Paste	10
Vat Violet BN Extra Paste	2
Vat Gray 2G Double Paste	1
Caustic soda	6
Hydro	6
Tamol	6

Pour into 10 gallons of water at 120°F containing 10 quarts of 56% acetic acid and 10 oz of Decerosol OT-25%. Strain into padder tank. Pad the cloth and run wet into 1 Williams unit at 160°F containing

Caustic soda	6 lb
Hydro	6 lb
Pad liquor	2 gallons

The wide variation in operating procedures in different mills is shown in the following chart giving the caustic-hydro usage of 5 mills dyeing a shirting blue shade on broadcloth:

FEED TO 2 UNITS PER MINUTE

Mill	1	2	3	4	5
Caustic soda, oz	10½	13	20	24	29
Hydro, oz	12	10	20	20	23
Gallons	3	3.6	3	3	6

Unit titrations vary from 0.25 oz/gal to 2.5 oz/gal for various shades in different mills.

REDUCTION & FIXATION IN STEAM ATMOSPHERES

ELECTROFIXIERER — The Electrofixierer of Anbauer described in German Patent 651,607, which came into use in several plants in Germany and Austria before World War II, is a forerunner of U S pad-steam processes. It makes use of a device manufactured by Benno Schilde Maschinenbau, and is employed for viscose as well as cotton fabrics. Cloth is padded through a pigment dispersion of vat dye, through either a water or a vat-acid dispersion, and then, either with or without intermediate drying, through a solution of caustic soda and sodium hydrosulfite. The cloth is next passed on to the Elektrofixierer for reduction and fixation of the dye. In the Elektrofixierer chamber the cloth is guided between or over electrically heated plates, and steam is injected into the chamber at the start of a run. During the run the supply of steam is decreased or cut off entirely, depending upon the volume of steam evolved from the moisture carried into the chamber by the cloth. To furnish sufficient moisture, a high pickup is necessary in the chemical pad.

An illustrative formula for the vat-acid procedure on a viscose fabric follows:

PREPARATION OF VAT-ACID DISPERSION

	Pounds
Vat dye single paste	24
Caustic soda	6
Hydro	8
Tamol	12
Sequestrant	1
Water to make	90 gal at 140° F

Reduce 20 minutes.

Add with rapid stirring to 56% Acetic acid	3 gallons
Water	7 gallons

Strain into padder tank.

Pad the cloth, dry in a hot flue, and pad again with a pickup of 110% through a solution containing

Caustic soda	6.0 oz/gal
Hydro	12.0 oz/gal
Salt	12.0 oz/gal

Run the cloth into the Elektrofixierer operating at 250-265°F. It will be observed that a high pickup is necessary in the chemical padder in order to provide sufficient moisture in the steamer and that the hydro consumption is higher than in U S processes.

ZITTAUER MASCHINENFABRIK PAD-STEAM RANGE—The pad-steam range developed by the Zittauer Maschinenfabrik in the 1930's is a close prototype of present U S ranges with a chemical padder, followed by a small steamer and an open-width washing range. In this range all the heat and plenty of moisture is furnished by an adequate steam supply to the steamer, electric heating plates are eliminated, the reduction atmosphere is air-free, and the chemical padder can operate at a desirable pickup of 60 to 80%.

U S PAD-STEAM METHODS—Development work by certain U S dyehouses and also by the duPont Company adapted the pad-steam idea to U S operating requirements, and aggressive promotion, together with several outstanding advantages, have resulted in widespread instal-

lation of pad-steam ranges in the U S and Canada. Its success is based on passing padded cloth through a cold caustic-hydro bath or through a hot caustic-hydro bath of *very small* volume in which relatively little chemical action occurs and then on subjecting the impregnated cloth to high temperature for only about 10 to 20 seconds in a steam atmosphere. Thus, difficulties due to leuco instability and varying affinity of different dyes are substantially eliminated. The speed with which a new shade can be matched, the relatively few yards in which a run settles down to a constant shade, the uniformity of shade throughout a run, and the elimination of the leader problem all contribute to the popularity of the pad-steam methods. Successful dyeing by this method does require very uniform preparation of a fabric and correctly designed and well-maintained equipment.

ILLUSTRATIVE FORMULA V, VISCOSE SHIRTING, weighing 4 oz/yd. Without intermediate drying between pigment and chemical padders.

PIGMENT PADDER, 6 tons pressure, pickup 80%

	oz/gal
Vat Fast Yellow Paste	4.0
Caustic	6.0
Tamol	1.0

Temperature 90°F.
Pad at 60 yards per minute and run wet into chemical padder.

CHEMICAL PADDER, 3 Rolls

	Start Pounds	Feed
Caustic	10	....
Hydro	12	5 oz per min
Tamol	1½	....
Pigment Pad Liquor	25 gal	....
Water to make	50 gal at 90°F	

Steam 20 seconds at 216°F.
Run into an open-width wash box, an open-width oxidation box, and then into rope-form rinsing and soaping equipment.

ILLUSTRATIVE FORMULA VI, 9-OZ COTTON SATEEN

PIGMENT PADDER, 60% pickup

	oz/gal
Vat Olive T Single Paste	9.0
Vat Olive Green B Double Paste	1.6
Vat Khaki 2G Double Paste	7.3
Vat Yellow GCD Single Paste	0.7

Pigment pad at 125 yards per minute, dry, and chemical pad at 65% pickup through a solution containing

	Start	Feed: oz/gal
Caustic soda	12 lb	6.0
Hydro	8 lb	4.0
Pigment pad liquor	3 gal	
Water to make	30 gal at 90°F	

Steam 12 seconds at 220°F.

ILLUSTRATIVE FORMULA VII, MERCERIZED TWILL

PIGMENT PADDER, 55% pickup

	oz/gal
Vat Brown G Double Paste	3.5
Vat Olive T Single Paste	0.5
Vat Yellow 3R Single Paste	0.3

Pigment pad at 125 yards per minute, dry and chemical pad at 65% pickup through a solution containing

	Start	oz/gal
Caustic soda	11 lb	6.0
Hydro	7½ lb	4.0
Pigment pad liquor	2½ gal	
Water to make	30 gal at 90°F	

Steam 12 seconds at 220°F.

ILLUSTRATIVE FORMULA VIII, VISCOSE-ACETATE FABRIC, ACETATE WHITE.

Reduced padding with steam fixation. Pad through a reduced solution at 110°F containing

	Start oz/gal	Feed oz/gal
Vat Blue BLNS Dbl Pst	3.0	3.5
Vat Violet BN Ex Pst	0.5	0.6
Caustic potash	2.0	2.0
Hydro	1.5	1.5

Run through chemical pad solution at 110°F containing

Soda ash	4.0 oz/gal
Hydro	2.0 oz/gal

Steam 12 seconds at 220°F.

To insure successful pad steam operation, certain precautions are necessary:

(1) The cloth must be uniformly absorbent.

(2) The pigment padder must exert absolutely even pressure along the nip.

(3) There must be no scum formation or dye aggregation in the pad box or its supply tank.

(4) The drier must apply heat evenly to both sides of the fabric and across the width to prevent migration of pigment dye.

(5) The cloth must be cooled before entering the chemical padder, or the chemical padder must have a cold-water jacket if the usual cold chemical bath is used.

(6) The chemicals for the chemical padder should be thoroughly dissolved, and it should be noted that care is required to dissolve completely 10 ounces of caustic soda and hydrosulfite per gallon of water at 90°F. Assistants must be chosen which remain in perfect solution in the presence of 10 ounces of electrolyte or more per gallon at 90°F and which prevent scum formation or specking out of dyes in the chemical padder. The chemical feed should pass through a cloth filter before entering the padder in order that no extraneous material from chemicals or water supply can be present in the padder trough to act as a nucleus for formation of dye specks.

(7) The steamer must be air free and at a temperature of not less than 214°F before a run is started. Temperatures between 216 and 220°F are recommended as they indicate that steam is being fed at a fully adequate rate.

(8) Steam condensation must be prevented at the cloth inlet to the steamer.

(9) The exit water seal must be kept cold by an adequate water flow. An adequate water flow and correct design are also necessary to prevent precipitates from accumulating in the liquor. The seal must be designed and operated so that water cannot splash onto the cloth.

With respect to the open-width range following the steamer, only a few remarks will be made about certain factors, which assume greater importance in view of the scarcity of chemicals and the consequent necessity of reducing their consumption to a bare minimum:

(1) Elliptical guide rolls in the bottom of the boxes greatly increase the efficiency of the boxes.

(2) Relatively hard rolls, which are properly crowned, most efficiently extract liquid from the usual fabric constructions. Open-meshed weaves and weaves with a very unlevel surface may require soft rolls.

(3) A spray pipe should be at the nip of wash boxes.

(4) Overflows for treatment boxes should be placed so that they insure the desired direction of liquor travel and should be designed to allow scum to flow away easily.

(5) The soaping treatment given in most ranges is very superficial. Its efficiency can be greatly increased by placing a simple steamer above the soap box.

In view of the scarcity of chemicals arising from the war effort, it may be of value to point out that with a sufficient number of well-designed boxes, equipped with elliptical guide rolls and efficient squeeze rolls and with an adequate water flow, neutralizing and oxidizing chemicals can often be eliminated. The highest available and suitable temperature promotes rate of reaction, rate of diffusion, and squeeze-roll extraction. It is probable that a simple steamer or a vacuum slot could replace chemical oxidation.

The chemicals that are used to neutralize caustic soda include the following:

carbon dioxide gas or scrubbed flue gas
sodium bicarbonate
acetic acid
formic acid
sulfuric acid;

and chemicals that are used to oxidize vat dyes, include the following:

hydrogen peroxide
sodium perborate
sodium, potassium or ammonium persulfate
sodium or potassium bichromate
sodium hypochlorite
sodium chlorite.

MOLTEN-METAL BATHS

STANDFAST MACHINE — The Standfast machine uses a molten-metal bath, in which dyeing takes place within the confines of cloth and its adhering liquor during passage of the impregnated cloth through the molten metal. Earlier devices using molten-metal baths appear in Nestellberger's patent application, I G No 70361, IV, dm, and in French

Patent 900,758.

The heart of the Standfast machine is a narrow iron U tube containing an eutectic alloy, such as Wood's Metal or Lipowitz Metal, of approximately 13.3% tin, 26.7% lead, 50% bismuth, and 10% cadmium, which melts at about 158°F and which is kept at about 220 to 240°F when it is used in vat dyeing. The two legs of the U tube are 5 feet deep, 1 inch wide, 5 feet long and 6 inches apart, giving a total passage through the metal bath of slightly over 10 feet. At the surface of the metal bath on the entry side is a bottomless stainless-steel dyebath in which an 8-inch-deep 1-gallon dyebath floats on top of the molten metal. At the exit side of the U tube is a similar bath containing a salt solution. At the bottom of the metal column the pressure is 20 pounds per square inch. The pickup of liquor in the device is 140%. This compares with typical U S padder pressures of 200 to 300 pounds per square inch and pickups of 55% to 75%. At the stated minimum cloth speed of 30 yards per minute, time of passage through the metal is 6.7 seconds, and, at the stated speed of 120 yards per minute, the time is 1.67 seconds.

So far as known to the writer, the Standfast Machine is not yet in operation in the U S or Canada, although considerable interest is expressed in the process and the few mill men who have seen the British installation have been favorably impressed. This review, therefore, is based on the patent description *(4)*, on the literature *(5, 6, 7)*, on experiments run in homemade laboratory models and on interpretation of all available facts.

In the present state of development, the Standfast Machine is used primarily for dyeing piece goods continuously in a leuco-vat dyebath floating on the metal surface. Boardman *(5)* states that 45,000 yards have been dyed in 11 hours and that over six million yards had been dyed at the time his article was written over 6 months ago.

The following direct quotation is from the Standfast brochure on the operation of the Standfast Molten-Metal Process: "To commence bulk dyeing, the dye liquor is pumped through a heater into the dyebath of small capacity, situated at the surface of a column of molten metal. Dye reaches the dyebath at a temperature of 158 to 167°F and is held at constant level automatically. As soon as the dyebath is full, the machine is started and the fabric, which is preheated by passage over a few steam-heated cylinders, passes through the 8-inch-deep bottomless dyebath directly into a column of molten metal held at 203 to 212°F. The length of passage through the metal is about 10 feet, and the fabric leaves by way of a second bottomless bath containing strong salt solution floating on the exit surface of the molten metal. Dyeing is complete when the fabric leaves the metal. Oxidation and soaping are accomplished in the conventional open-width soaper with which the dyeing machine operates.

Recipes are first established by an assistant chemist on a laboratory-scale machine using the actual fabric and dyes to be employed on the large-scale machine.

Dyes and auxiliaries are mixed in ground tanks to the approved recipe. The dye liquor is mixed cold and may be stored for some hours before use. The bulk liquor is again checked on the sample machine before use. At the end of a dyeing, cleaning liquor is circulated through the dye supply system, which is then drained ready for the new dyeing, the whole operation occupying only a few minutes.

Shade matching is carried out on a small machine with cloth 3 inches wide and with about 20 inches of immersion in molten metal. Small nip rolls are motor driven to give a cloth speed allowing for optimum time of immersion. Shades dyed on this machine are reproduced exactly on the bulk machine with no adjustment of recipe.

The easy removal of dye and salt baths as a unit facilitates cleaning of the molten-metal surface. This operation is carried out once weekly and occupies a few minutes.

It is common practice to dye pale to medium shades at 60 to 100 yards per minute, and, medium to heavy shades at 30 to 60 yards per minute; yet these figures are not to be regarded as a maximum."

For vat dyeing by reduced methods, the Standfast machine should offer several potential advantages over many, if not all, prior methods for reduced dyeing, including the following:

(1) The leuco bath floating on the molten metal is only about 1 gallon in volume, with a consequent rapid turnover and a minimizing of tailing off. As an extra precaution the bath is circulated by a pump.

(2) The leuco stock solution can be kept at the optimum temperature for stability and heated to the desired impregnation temperature as it flows into the bath through a heater capable of heating 8 gallons of flowing dye liquor per minute from a temperature of 65 to 167°F.

(3) The efficient heat transfer from molten metal to impregnated cloth, which almost instantly heats the cloth to 200°F or higher, and the exclusion of air permit accurate control of the reduction and fixation process. The beneficial effect of simultaneous high temperature and pressure on diffusion, penetration and leveling should produce more satisfactory dyeings than most of the older leuco dyeing processes. It is claimed that most fabrics and shades can be dyed by the reduced process and that pigment-padding methods are used only for very tightly woven cloths or very dark shades.

(4) It is claimed that formulas produced on a laboratory model repeat exactly on the mill machine and that trial patching and formula adjustments in the mill are unnecessary.

(5) It is claimed that shade changes average about 5 minutes except for radical changes, such as a dark green to a pink, when slightly more time is needed.

(6) Since trial patching in the dyehouse is not necessary and since average cleaning time is 5 minutes, it is feasible to dye very small lots of 1000 yards or less. Even in the dyeing of small lots or in running at cloth speeds lower than those usual in the U S, daily production can attain a satisfactory total.

(7) It is claimed that concentrations beyond the solubility limit of a dye can be used and that dye not in solution is taken care of during passage through the molten metal. Shades as heavy as 40% have been dyed.

(8) Uniform squeezing of uneven weaves, such as waffle piques or heavy slub weaves, occurs in the molten-metal bath in contradistinction to the effect produced by squeeze rolls. Side shading should also be eliminated.

(9) The short cloth travel and consequent slight tension exerted on the cloth should be of particular value to constructions of man-made fibers.

(10) Because of small dyebath volume and low liquor ratio, it is claimed that the different dyeing behaviors of vat dyes can be ignored.

For vat dyeing by methods in which an aqueous dispersion of vat dye is first padded on the fabric and then the fabric is passed through a caustic and hydro bath floating on the metal surface, the present Standfast machine allows much less time for reduction and fixation than the U S methods, such as pad-steam and dyeing in the Williams unit. At 60 yards per minute, passage through the molten metal requires 3 1/3 seconds, and at 120 yards per minute the time is 1 2/3 seconds. Boardman *(5)* states that, at speeds upwards of 30 yards per minute, any vat dye or combination of vat dyes can be dyed in any depth of shade.

Depending on their construction, various fabrics entrain small amounts of the expensive metal alloy, and, if this metal

is not recovered, it is stated that the loss can amount to 0.1 per cent per yard or more. This entrained metal will melt out in boiling water or soap baths and can be recovered from the cool liquid. The total metal alloy in a Standfast machine is worth in the neighborhood of $7000 at current quotations. There has been no statement regarding the tendency of the hot caustic and hydro solutions to attack the metal alloy.

ILLUSTRATIVE EXAMPLE I FROM STANDFAST PATENT—Cloth is padded at 60% pickup through a bath containing

	oz/gal
Caledon Blue RNS	20.0
Gasoline Oil HS	4.0
British Gum, 1:1	10.0

The wet cloth is then passed through the chemical bath floating on the entrance end of the metal and containing, at 60°F

	oz/gal
Caustic soda	6.0
Hydro	8.0
Teepol	1.5

Passage through the metal bath at 225° F requires 10 seconds.

ILLUSTRATIVE EXAMPLE II FROM STANDFAST PATENT—Dry cloth is passed through a bath floating on the entrance surface of the metal and containing

	oz/gal
Caledon Blue RNS	6 2/3
Caledon Red BNS	6 2/3
Gasoline Oil HS	1½
Caustic soda	3
Hydro	3
Sodium formaldehydesulfoxylate	2/3

The cloth passes through the metal in 15 seconds.

Judging from other literature, we may conclude that lower temperatures and shorter times than given in the patent are used in mill practice.

II. CONTINUOUS WARP DYEING WITH VAT DYES

Another field of vat-dye application which is undergoing evolution at the present time is warp dyeing.

PAD-STEAM DYEING OF LONG-CHAIN WARPS—The pad-steam dyeing of long-chain warps with vat dyes produces faster and better-penetrated dyeings at much higher production rates than the older multiend warp-dyeing process. As many as 18 15,000-yard, 400- to 500-end ball or log warps are fed directly into a heavy pigment padder, then into a chemical saturator, then into a steamer, where they are steamed about 15 seconds, then through rinsing, oxidation, and soaping boxes, and, finally, over dry cans. The entire process for the above example requires 5 to 6 hours.

ILLUSTRATIVE EXAMPLE — 18 15,000-yard warps of 12s/1 cotton yarn.

PIGMENT PADDER, 13 tons pressure, 60% pickup

	Start oz/gal	Feed oz/gal
Vat Direct Black DDB Double	90.0	56.0
Decerosol OT 25%	1.0	1.0

The dry warps receive 2 dips before each nip; immersion time is 14 seconds at 40 yards per minute.

The padded warps then go through a chemical saturator, which in one installation is a Williams unit and in another is a simple U tube. Excess liquor is removed from the warps by wiper bars or wiper rolls and not by squeeze rolls in order that the pickup may be well over 100%. A large pickup is necessary with long-chain warp yarn. The saturator contains 5 oz of caustic soda and hydro per gallon in the above example, but these concentrations vary according to the requirements of specific dye formulas.

The warps then enter the steamer and are steamed about 15 seconds at 214 to 220°F.

Although the above example illustrates the method, starting- and feeding-bath proportions vary for different formulas and for different installations; the chemical concentrations in the saturator and the steaming time also vary.

UNISTEL-BATCHELDER MACHINE —Various methods of dyeing yarn in the slasher or of dyeing yarn unreeling from section beams have been in use in the U S and Canada for many years, but they lacked the versatility and modern construction of the Unistel-Batchelder machine, which is installed in a Canadian mill *(8)*.

In the application of vat dyes on a Unistel-Batchelder machine yarns from section beams are fed through a pigment padder, into a chemical saturator, into a steamer, through rinsing and oxidation boxes, over dry cans, through a slasher and finally are wound on loom beams. The dyeing steps are similar to those described above for long-chain dyeing. Potential advantages of this method are the greater ease of dyeing yarn in web form level as compared with yarn in long-chain warps and the combination of several handling steps into one continuous process. The present model is designed for a maximum speed of 50 yards per minute.

Undoubtedly the Standfast molten-metal machine could be used in place of the chemical saturator and steamer in this range for dyeing by the pigment-padding procedure, and in place of the padder, chemical saturator, and steamer for dyeing from solutions.

WARP DYEING BY CALCOTHERM PROCEDURE—The use of sodium nitrite to stabilize the leuco compound in the application of vat dyes by various warp-dyeing processes has been found advantageous, particularly in multipass methods where the dye may be in reduction for several hours. Even at normal temperatures such as 120 or 140°F, leuco compounds of anthraquinone vat blues are not stable in prolonged reduction. The addition of 1 oz of sodium nitrite per gallon of bath has permitted the satisfactory dyeing of the particularly unstable Vat Blue RS by a long-chain warp-dyeing procedure requiring 6 ends through the dyebath.

III. PACKAGE DYEING

The third field of vat-dye application discussed in this paper is package dyeing. As stated in the introduction, only certain phases of present package-dyeing practice will be covered, for complete coverage of this field would require a full paper in itself.

MACHINES—Newer machines provide rates of liquor flow of 4 gallons or more per pound of yarn per minute, permit washing of packages without any recirculation of liquor, provide for steaming the load before dyeing, and provide for heating by steam or cooling by circulation of cold water. Some machines have a flow meter and means for adjusting the rate of flow.

SPECIAL METHODS FOR SPUN VISCOSE YARN, HARD-TWISTED MERCERIZED COTTON YARN, ETC—Spun-viscose yarn is successfully dyed by entering the dry packages into the pigment dispersion at room temperature, starting the circulation, adding a retardant, caustic, and hydro, and then slowly raising the temperature to the proper degree. An

effective and cheap retardant consists of 3 parts of sodium lignin sulfate and 1 part of Epsom salts.

In another method, after the circulation of the pigment dispersion, 3% soda ash and 5% hydrosulfite are slowly added during 30 to 60 minutes, then 5% caustic soda is added and the temperature is slowly raised to the desired limit.

The vat-acid method consists of circulating a vat-acid dispersion, practically devoid of fiber affinity, through the packages and then slowly trickling a caustic-hydro solution into the bath to convert the dye to the sodium leuco compound with normal fiber affinity and thus control the exhaust of the dye on the fiber.

THE ABBOT-COX PROCESS OF BRITISH PATENT 593,008—The Abbot-Cox process of B P 593,008 is a rather long process that is not used in the U S or Canada to the writer's knowledge *(9, 10, 11)*. Trials by the writer and by various American mills have not shown any advantages over the present methods in use for cotton or for spun-viscose packages or beams. British literature indicates that it is used in England, particularly in dyeing viscose cakes with vat dyes. The following procedure taken from the patent illustrates the method:

Stir 25 parts of Caledon Blue RC Paste Fine into 250 parts of water containing 50 parts of Dispersol VL. Add the dispersion to 10,000 parts of water at 195 to 205°F and circulate 60 minutes through 500 parts of viscose cake. Dissolve 12½ parts of salt in 125 parts of water, and add solution in 5 portions to the machine at 10-minute intervals while the bath is cooled to 140°F. Add 100 parts of 68°Tw caustic soda, 75 parts of hydrosulfite, 75 parts of sodium formaldehyde sulfoxylate and circulate 120 minutes at 140°F. Rinse, oxidize and aftertreat. The circulation time in the dyebath alone adds up to 4 hours.

The intent of the procedure is to precipitate pigment dye slowly and evenly throughout the textile material and then to reduce and fix it in the precipitated position. It is interesting to note, however, that in a series of package dyeings run many years ago during a Calco investigation of the customary U S type of pigment procedure on a 25-package machine, that, if a pigmented package was replaced by a fresh package just before the addition of caustic soda and hydrosulfite, this package showed no inferiority to the other packages when dyeing was complete.

U S PIGMENT METHODS—Various modifications of quick pigment-dyeing procedures are used for perhaps 80% of U S package-dyeing production.

ILLUSTRATIVE EXAMPLE I, MERCERIZED THREAD

100 lb of 30s/3 mercerized thread in a 1:10 liquor ratio. Disperse 30 lb of Vat Direct Black Paste in the machine at 200°F. Enter the dry yarn, circulate the dispersion for 10 minutes and then make the following additions:
Caustic soda, 10 lb.
Hydrosulfite, 8 lb.
Circulate the solution 45 minutes at 200°F, turn on the cold water and rinse the packages inside out without recirculation, the cold wash water being allowed to overflow to the drain. When the pH of the bath drops to 9.0, and the effluent is clear, turn off the cold water. Then make the following additions:
Hydrogen peroxide, 100 vol, 1 lb
Acetic acid, 56%, 1 lb
Circulate the acidified oxidizing liquor while it is being heated to 140°. Then add
Soda ash, 3 lb and
Soap flakes, 3 lb
Heat the circulating soap liquor to 200°F and continue the soaping at 200°F for 20 minutes. Turn on hot water and rinse inside out without recirculation, overflowing to the drain until the effluent is clean and free from soap.

With adequate water and steam supplies, this procedure, from loading in the carrier to its removal will require about 2¼ to 2½ hours.

ILLUSTRATIVE EXAMPLE II, CALCOTHERM PROCESS

100 lb of 20s/1 cotton yarn in a 1:10 liquor ratio.
Disperse in the machine at 180°F

Vat Blue BLD Double Paste	8 lb
Vat Violet 4RP Extra Paste	½ lb
Sequestrant	¼ lb
Soap Flakes	2 lb

Circulate the vat pigment through the packages for 10 minutes and then make the following additions:
Sodium nitrite, 8 lb
Caustic soda, 8 lb
Circulate nitrite and soda for 5 minutes and then add
Hydrosulfite, 6 lb
Circulate the hydrosulfite for 30 minutes at 190°F; rinse, oxidize and soap the yarn as in Example I.

ILLUSTRATIVE PROCEDURE III, CALCOTHERM PROCESS WITH RETARDANT

100 lb of 16s/1 cotton yarn in a 1:8 liquor ratio. Wet out the yarn at 195°F and add a dispersion of
Vat Blue BLD Double Paste, ½ lb
Circulate vat pigment for 5 minutes at 195°F and add the following dissolved together:
Sodium lignin sulfonate, 3 lb
Epsom salts, 1 lb
and then the following:
Caustic soda, 4 lb
Sodium nitrite, 4 lb
Circulate the solution for 5 minutes and finally make an addition of
Hydrosulfite, 4 lb
Circulate the hydrosulfite for 30 minutes at 195°F. Rinse, oxidize and soap the dyeing as in Example I.

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(3) Vat Dyeing, *Calco Technical Bulletin #810*.

(4) Morton Sundour Fabrics, British Patent 620,584.

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(7) Molten-Metal Dyeing Perfected in England, *Textile World*, 100, 94 (1950).

(8) Scott, R C, New Positively Controlled Tension Continuous Warp Dyeing, *Textile World*, 100, 114-117 (1950).

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(10) Abbot-Cox, New Method for Dyeing Yarn Packages, *Dyer*, 95, (403-4) (1946).

(11) Richardson, T & Wiltshire, E R, The Abbot-Cox Process as Applied to Cotton, *J Soc Dyers Colourists*, 63, 224-8 (1947).

Hudson-Mohawk Meeting Dates for '51-'52

WILLIAM A NELSON, secretary of the Hudson-Mohawk Section has disclosed the following meeting dates for the 1951-52 season:

June 22, 1951—Annual Outing, Wolfert's Roost Country Club, Albany, N Y

September 21, 1951—Jack's Restaurant, Albany

October 26, 1951—Hotel Utica, Utica, N Y

December 7, 1951—Jack's Restaurant

February 1, 1952—Jack's Restaurant

March 21, 1952—Jack's Restaurant

May 2, 1952—Jack's Restaurant

June 20, 1952—Annual Outing

PAPERS FOR GROUP MEETINGS AT NATIONAL CONVENTION

ANYONE desiring to contribute a paper to a group meeting at the National Convention in October should notify the Technical Program Chairman, William A Holst, National Aniline Division, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N Y, as soon as possible giving the title of the proposed paper and the group to which it is to be presented. Subjects to be covered in the four group meetings are: Dyeing, Printing, Finishing, and Auxiliaries and Testing. Complete information regarding the technical program appears on page P113 of the February 19th issue.

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

51-1

Education: Penna. State College, B.S. Chem. Engg.

Experience: Chemist, dyer and textile printer, executive.

Age 42; married; references; east coast preferred.

5-14

Members of the Student Chapter, Lowell Textile Institute

CHAIRMAN ROBERT W SUMERS (2nd row, center) is flanked by faculty advisors Ernest P James (left) and Robert J Peirent (right). Other officers of the chapter include: Samuel A Wood, vice-chairman; Joseph A Roux, secretary; George A Scagos, assistant secretary; and John J Kelleher, treasurer.

Rhode Island May Meeting Program

THE May 25th Meeting of the Rhode Island Section, to be held at Johnson's Grill, Providence, will feature talks by Dr Robert J Thomas of E I du Pont de Nemours & Company, Inc, and Dr Edward Coughlin, director of the Textile Laboratory of the Good Housekeeping Institute.

Dr Thomas will discuss "Aqueous Dyeing of New Synthetic Fibers at High Temperatures." Dr Coughlin will speak on "Textile Testing from the Consumer's Standpoint."

—♦ ♦—

Membership Applications

CORPORATE

Goodall-Sanford, Inc, 2 High St, Sanford, Me.

SENIOR

Harold E Abbott—Salesman, Ultra Chemical Works, Inc, Paterson, N J. Sponsors: F H Buck, Jr, W G Helmus.

Clarence W Angline—Overseer Rawstock & Beam Dyeing, Eagle & Phenix Div, Fairforest Co, Columbus, Ga. Sponsors: H J Gambert, W P Culpepper.

Hermann H Behrens—Div Sales Mgr, Irwin Dyestuff Corp, Ltd, Toronto, Ont, Canada. Sponsors: B R Celentano, C Z Draves.

William J Ferracone—Tech Sales Repres, Takamine Lab, Inc, Clifton, N J. Sponsors: P J Wood, E G Snyder .

Robert R Fliegel—Dyer, Nat Dye & Finish Corp, Culver City, Calif. Sponsors: R B Coleman, H B Fenn, Jr.

Allison F Beane—Salesman, Belle Chemical Co, Inc, Charlotte, N C. Sponsors: G O Linberg, W B Carroll, Jr.

Andrew J Dahlke—Chem Engr, American Dyewood Co, Chester, Pa. Sponsors: C J Carroll, S Shultz.

Harlan B Freyermuth—Group Leader, General Aniline & Film Corp, Easton, Pa. Sponsors: C Lawsberg, D E Marnon.

John N Gammon—South Dist Mgr, Nopco Chemical Co, Cedartown, Ga. Sponsors: F L Kibler, D S Rion.

Curt A Gunther—Finisher, Foreman & Supervisor, Liberty Fabrics of New York, New York, N Y. Sponsors: C M Mueller, J Davagne.

Frank C Heller—Chief Chemist, The Schlichter Jute Cordage Co, Philadelphia, Pa. Sponsors: F Rhodes, G E Fleming.

Gabriel Illovsky—Partner, Master Dyeing Co, Long Island City, N Y. Sponsors: J Colman, A Messer.

Hugo Lauber—Dyer, Liberty Fabrics of New York, Bronx, N Y. Sponsors: J Colman, A Messer.

George L Marshall—Agent, Rayon Div, North Carolina Finishing Co, New York, N Y. Sponsors: J G Stass, J Leach.

Herman I Mueller—Overseer Package Dyeing, Bibb Manufacturing Co, Macon, Ga. Sponsors: L E Whittelsey, C M Mueller.

Mark Pettit—Chief Chemist, Hemingway & Bartlett Mfg Co, Watertown, Conn. Sponsors: E Young, H C Selya.

Joseph M Quinn—Chemist, Hemingway & Bartlett Mfg Co, Watertown, Conn. Sponsors: W E Small, R C Morrison.

George T Roberts—Text Chemist, Greenville Finishsing Co, Greenville, R I. Sponsors: W Sims, E H Gamble.

Henry Ruegg—Exec Vice Pres & Treas, Ultra Chemical Works, Inc, Paterson, N J. Sponsors: F H Buck, Jr, W G Helmus.

Willard K Sawyer—Head Dyer in chg of Dye House, Glen Raven Knitting Mills, Inc, Altamahaw, N C. Sponsors: R H Smith, W A Daniel.

Raymond J Schadewald—Salesman, American Cyanamid Co, Philadelphia, Pa. Sponsors: R J Schadewald, Sr, J A Branegan, Jr.

Howard F Schoellborn—Asst Chemist, S & M Dye Works, Philadelphia, Pa. Sponsors: T R Foltz, Jr, J P Senior.

Albert Sharphouse—Chief Chemist, Exec Secy, Ultra Chemical Works, Inc, Paterson, N J. Sponsors: F H Buck, Jr, W G Helmus.

Arthur R Smith—Salesman, Ultra Chemical Works, Inc, Paterson, N J. Sponsors F H Buck, Jr, W G Helmus.

William H Spuhler—President, Ultra Chemical Works, Inc, Paterson, N J. Sponsors: F H Buck, Jr, W G Helmus.

Gordon E Wallace—Salesman, Arkansas Co, Newark, N J. Sponsor: C N Rabold.

JUNIOR

Tobias Jannink—Student, Higher Textile School, Enschede, Holland, Sponsors: C K Black, C A Sylvester.

Harold E Keene, Jr—Chem Engr, American Thread Co, Kerr Mills, Fall River, Mass. Sponsors: C W Broadhurst, R C Bogle.

Richard E Mackey—Chemist, Broadalbin Knitting Co, Broadalbin, N Y. Sponsors: H Gendreau, C H A Schmitt.

Fernando R Maia—Chemist, Cotorificio da Torre S A, Brazil. Sponsors: E Grieder, A F Conchon.

ASSOCIATE

Cameron A Baker—Research Engr, U S Testing Co, Inc, Hoboken, N J.

Bernice M Montgomery—Marketing Consultant & Export-Import, Hotel Tokyo, Tokyo, Japan.

STUDENT

Justin J. Clarke—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Charles W Cox—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Allan A Curtis—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Richard A Diekman—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Peter W Dulken — Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Drew B Daubert and C W Bowden, Jr
Co-authors of the paper "Control of J Boxes and Steamers in Continuous Bleaching", which appeared in the April 30 issue on page P286. Mr Bowden (right) presented the paper at last year's Annual Convention in Portsmouth.

John F Florentino—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

George W Gannon—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

John Kelleher—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Joseph M. Kuschawara—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Robert T Muhler — Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Joseph C Notaro — Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

James M Polito—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Raymond J Rotsaert—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Rudolph G Simone—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Sheldon T Wright—Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

Robert S Zecker — Fairleigh-Dickinson College, Rutherford, N J. Sponsor: H R Mauersberger.

George F Nurnberger — Rhode Island School of Design. Sponsor:H B Sturtevant.

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BOOK REVIEWS

INTRODUCTION TO TEXTILE CHEMISTRY

Bruce E Hartsuch
First Edition, 413 pages; $4.75
John Wiley & Sons, Inc, New York (1950)

A splendid new treatment, this book will be warmly welcomed by colleges teaching textile chemistry, and it will be equally useful to technicians and executives of the textile industry. The major portion of the book is devoted to advanced concepts of textile chemistry, but its value will not be lost to readers with a weak background in chemistry for the author has included an excellent chapter on organic chemistry, which is so slanted towards the chemistry of textiles as to make it very enjoyable reading.

The rest of the text is devoted primarily to the chemistry and properties of the textile fibers, but includes a chapter on soap and a chapter on water. The former chapter contains a good discussion of detergent action, and a short, fundamental section on the synthetic detergents. The chemistry of cellulose embraces a very well written chapter, which lays the proper foundation for the study of cotton and rayon, which are treated in subsequent successive chapters. Incidentally, one of the few typographical errors crept into this chapter, showing a glucose anhydride monomer with an open ring, on page 138.

The properties and the chemical processing of cotton are well described, and various testing methods for process control are given. It is regrettable that the simpler Turnbull's Blue test for oxycellulose is not presented, instead of the more complex and no more sensitive Krajcinovic diazotized amine test. Similarly, the Baryta Number could well be given among the tests for mercerized cotton. Several pages are devoted to an excellent discussion of the synthetic finishes for cotton, but there is no information on starch which is still one of the most important cotton finishing agents.

The Cuprammonium, the Viscose, and the Acetate processes of rayon manufacture are described in the chapter on rayon, and a very brief discussion of rayon finishing is also included. No mention is made of the Sanforset process for shrinkage control, but the Definized process is described and the theory explained.

The chemistry and the chemical processing of wool are well presented, with recent data to substantiate the information. Other salient features of this chapter cover the physical properties of wool, scouring, theories of felting, shrinkproofing, setting, and the reactions of wool with various reagents. Some discussion of the modern approach to mothproofing would be a desirable addition to this chapter, for this is one of the greatest problems in the area of woolens and worsteds.

Separate chapters are devoted respectively to silk and nylon. The origin, reeling and throwing, the chemical processing, and the properties of silk are discussed. The history, the manufacture, the properties, and the uses for nylon are thoroughly treated.

Another chapter is given to vinyon, saran, and Orlon and covers the manufacture and the properties of these plastic fibers. The final chapter is devoted to the manufacture and the properties of the artificial protein fibers Vicara and soybean, the only two of commercial importance today.

This is a splendid book, containing a wealth of information that is nowhere so readily available. The literary style is excellent; the arrangement is quite logical although the chapter on the artificial protein fibers might have immediately succeeded the chapters on the natural protein fibers. A glossary of terms used in the textile industry is given as an appendix and will prove useful to many readers. The index is well prepared and cross referenced for easy access to any desired point. In summary, this book is highly recommended reading for all who work with textile fibers.—JBM

POLAROGRAPHIC METHOD OF ANALYSIS

Otto H Müller
Second Edition. xii + 209 pages, $3.50
Chemical Education Publishing Co, Easton, Pa

The author states in the preface that his purpose is "to present a simple account of polarography in a form which can be used by teachers and students . . ." He might also have stated that the book is a good source of information on polarography for the practicing chemist who wants to learn the fundamentals of this method of analysis.

A chemist knowing nothing about polarography can read this little book and gain a good knowledge of the principles behind the method, and probably decide whether it will be of use in his work.

The book was written for class use and includes experiments as well as theory. It is unfortunate that the experiments are mixed in with the text. In several cases it is necessary to perform the experiment to follow the text. This is impossible for one using the book for self study, and inconvenient for the instructor wishing to assign material for class study.

The author describes a piece of simple and easily constructed apparatus with which most of the experiments may be performed. Some of the laboratory directions are written so that the experiment can only be performed with this setup.

There are chapters on Elementary Theory, Apparatus, Quantitative Analysis, Qualitative Analysis, Polarometry, Recent Developments, Applications, and Suggestions for Practical Polarography.

The appendix contains useful tables and a short bibliography.—WGC

THE CHEMICAL FORMULARY

H Bennett (Editor-in-Chief)
Volume IX; 648 pages; $7.00
Chemical Publishing Company, New York (1951)

This collection of commercial recipes and formulas needs no formal introduction, for its eight predecessors have been well-known and widely used for years. This volume contains twenty-one chapters, each devoted to a different phase of the chemical industry. Chapters 5 (Colloids), 18 (Resins, Plastics), 19 (Soaps), and 20 (Textiles) contain formulas of particular interest to textile chemists. For example, in the 20 page chapter on textiles, recipes are given for Antishrink Rayon Treatment, Crease-Resistant Rayon, Vat Dyeing of Wool, Printing of Nylon Fabrics, etc. Many of these recipes and formulas were taken from the patent literature, in which cases a reference is given.

Other useful features are found in the appendix, which contains several tables and directories of chemical suppliers. Finally, there is a good page index for ready reference to any desired formula.

This type of book is always a useful reference in any laboratory, for all too often the chemist is called upon to prepare an odd compound about which he knows little or nothing; and it is comforting to have such a volume to guide him.—JBM

INTRODUCTION TO GENERAL TEXTILES (Laboratory Manual)

H T Stevens and H L Richey
64 pages (perforated); $1.75
Burgess Publishing Co
Minneapolis, Minn (1950)

This mimeoprinted, ring-bound manual is designed for an introductory laboratory course for students with a home economics major. It contains sixteen experiments, aimed at familiarizing the student with various yarn and fabric constructions; natural, artificial, and synthetic fiber characteristics; and properties of some of the textile finishes. The preface to the manual contains a list of eight reference texts for supplemental reading.—JBM

COMING EVENTS

AMERICAN ASSOCIATION OF TEXTILE TECHNOLOGISTS

Meetings: June 6, September 12, October 3, November 7, December 5 (Builders Club, New York).

AMERICAN CHEMICAL SOCIETY

Meetings: September 3-7 (New York, N Y).

AMERICAN LEATHER CHEMISTS ASSOCIATION

Convention: June 11-13 (The Griswold, Groton, Connecticut).

AMERICAN SOCIETY FOR TESTING MATERIALS

Annual Meeting, June 18-22, Atlantic City, N. J.

Spring Meeting and Committee Week, March 3-7, 1952, Cleveland, Ohio.

Annual Meeting, June 23-27, 1952, New York, N. Y. (The biennial Apparatus and Photographic Exhibits will be held in conjunction with this meeting).

NATIONAL ASSOCIATION OF TEXTILE MACHINERY MANUFACTURERS

Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantic City, N. J.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES

Luncheon Meetings—Hotel Commodore (September 12, October 10, November 14).

Spring Outing—The Greenbrier, White Sulphur Springs, W Va (June 14-16).

Annual Meeting and Dinner—Hotel Commodore (December 11).

TEXTILE RESEARCH INSTITUTE

Annual Meeting, Nov. 8-9.

NEWS

• American Aniline Opens New Building in Chattanooga

G L Armour, president of American Aniline Products, Inc, New York, one of the largest U S dyestuff suppliers, has announced the completion of a new building for the Chattanooga, Tenn, branch at 4001 Rossville Boulevard. It is reported that many prominent Southern textile executives were on hand for the elaborate opening day ceremonies as the company moved into the new quarters earlier this month.

The new, modern structure, as part of the company's plan for expanded service to textile centers (especially in the South), provides spacious warehouse facilities, general offices and laboratories on a tract of land 160' x 160', leaving room for expansion to the rear. Construction is of brick, concrete and steel with an overall area of 12,000 square feet. Mangum W Sloan of Charlotte, N C, was the designer; construction was done by the Southeastern Construction Company.

The entrance leads into a well defined foyer, with air-conditioned general administrative offices, manager's office and sales office leading off. The laboratory is situated for the most advantageous use of northern light. Office flooring is of asphalt tile, with acoustical tile ceiling. The entire building is equipped with radiant floor heat. Shipping and receiving can be accomplished simultaneously in the warehouse.

As previously announced, Joe T Bohannon, Jr, formerly of Newnan, Ga, will be manager of the new branch. Mr. Bohannon has been with the company for 13 years.

The sales staff includes Rufus W Freeze of Chattanooga and Charles O Stairnes, of Rome, Ga.

In the application laboratory facilities, the company reports that it is able to duplicate any phase of dyeing, printing, finishing or wet processing. Samuel C Hennessee of Chattanooga is in charge. Mr Hennessee has held important supervisory positions in Southern dye houses and finishing plants over the past fifteen years.

American Aniline maintains warehouse facilities at Charlotte, N C, in addition to the Chattanooga branch. Its main plant facilities are in Lock Haven, Pa.

The company is said to have selected Chattanooga as another southern distributing center, primarily because the city and its environs is one of the most compact textile centers in the South. Local trucking facilities to any point are quite adequate. Furthermore, by using its own fleet of large trailer trucks, the company maintains a regular schedule of truckload deliveries to company owned warehouses throughout the country and also to many of its customers. This service will be used to replenish stocks to be carried in Chattanooga, it is reported.

Company officials are high in their praise of the co-operation extended in the past by the city of Chattanooga and its officials.

• Celanese Chemical Plant to Locate at Pampa, Texas

Plans for the construction of a modern chemical plant in the panhandle area of Texas have been disclosed by the Celanese Corporation of America. Erection of the plant at Pampa is calculated, according to Celanese president Harold Blancke, to provide an additional source of raw materials necessary to meet increasing demand for company products and to supply chemicals for an accelerated defense plant.

The process to be utilized at the new plant is said to be a result of the petroleum chemical research and development work carried out at the Celanese laboratories at Clarkwood, Texas.

"Output of the plant," Mr Blancke declared, "will supplement the chemical producing activities of the company at Bishop, Texas." The plant site at Pampa is fifty miles east of Amarillo in West Texas, and is in the heart of a rich petroleum area which will furnish both the hydrocarbon feed stocks for chemical processing and the natural gas for fuel.

Air View of the du Pont Experimental Station Showing Effects of a $30,000,000 expansion program. Most of the new construction is in the open area near the top of the picture.

• Du Pont Experimental Station Addition Dedicated Before 200

Some 200 academic and industrial scientists were on hand in Wilmington on May 10 for the dedication ceremonies of the du Pont Company's new Experimental Station addition, reportedly a $30,000,000 investment.

Guests were welcomed by Dr Elmer K Bolton, head of the Chemical Department, and heard Granville M Read, Engineering Department director, speak on the design and construction highlights of the addition. Members of the company's Board of Directors, departmental officials and heads of research staffs accompanied the guests to an afternoon inspection of the new laboratories and an exhibit of the types of research undertaken at the station. Dr James B Conant, Harvard University president, and Crawford H Greenewalt, president of du Pont, addressed the group at a banquet in the evening in the Hotel Du Pont.

The expanded station, near the site of the company's original plant beside Brandywine Creek, is said to house nearly half of du Pont's research personnel. The original station was established in 1903, one year after the founding of the Eastern Laboratory at Gibbstown, N J.

The new area is on a 57-acre rolling tract that formerly was part of an employees' country club, now replaced by a new one nearby. The former clubhouse has been remodeled into a cafeteria. The individually-landscaped laboratory buildings, of red brick facing with limestone trim, are located in a rectangular arrangement in the new area.

Nineteen buildings were constructed in the expansion program, including nine laboratory buildings, one of which is located in the older area, and 10 service buildings. Two of the laboratory buildings in the older area were substantially enlarged as part of the project.

The basic unit is a two-man laboratory room 25 feet in length and 19 feet in width. A full-scale "mock-up" of this was built and altered to incorporate suggestions of chemists and engineers during studies that lasted more than a year.

New 10-foot-long laboratory bench hoods, much larger than those formerly used, and the laboratory rooms themselves, are force ventilated. Cylinders containing gases used in research work are placed in special cabinets outside the laboratory rooms and are connected by tubing to the hoods and benches.

The station now has about 800 research workers representing a wide range of sciences, in addition to 1500 nontechnical employees.

It is reported that du Pont in 1950 spent $38,000,000, exclusive of construction costs, to support its research activities.

• Hatch Celebrates 25th Anniversary

Hatch Textile Research, an independent textile testing laboratory, is currently celebrating a quarter century of service to industry and the retailer. Offices of the organization, of which Herbert H Hatch is director, are located in New York at 25 East 26th Street.

• Henry Howard Receives 45th Perkin Medal

"In recognition of his important and distinguished services to American chemical industry extending over a period of more than forty years", Henry Howard was awarded the 45th impression of the Society of Chemical Industry's Perkin Medal on April 27th. Marston Taylor Bogert, a past president of the Society, made the presentation at a joint meeting of the American Chemical Society, the American Institute of Chemical Engineers, the Electrochemical Society and the American Section of the Society of Chemical Industry, held at the Waldorf Astoria in New York.

Francis J Curtis, vice president of Monsanto Chemical Company, introduced Mr Howard with his talk "The Medalist and his Accomplishments". Gustavus J Esselen, American Section chairman and vice president of the United States Testing Company, presided.

• Facts Clarified About Holyoke Calendar Rolls

The Holyoke Machine Company of Holyoke, Massachusetts has issued a special statement in an effort to clarify the fact that it is now, and has been continuously since 1880 the sole manufacturer of "Holyoke" paper, cotton and combination calender rolls for the paper and textile industries. The company, which was founded in 1863, is likewise the sole manufacturer of "Holyoke" and "Norwood" Water Filtration Equipment for industrial, institutional and municipal applications.

• New Los Angeles Branch Location for USTC

Frank Brennen, Los Angeles branch manager of the United States Testing Company, has announced the removal of that branch to a new location at 1723 South Maple Avenue, Los Angeles 15, California. The newly constructed building is said to give the laboratories several thousand feet of adaptable space and it is reported that much new equipment will be installed. Many of the testing company's services, which were formerly referred to Hoboken, N J, will now be conducted in Los Angeles. At present the Los Angeles branch is equipped to handle chemical, paint, engineering, and engineering-inspection tests.

• Maguire Heads Textile Division USO Campaign

John P Maguire, Jr, John P Maguire and Co, Inc has been named head of a newly-formed textile division of the Commerce and Industry Division of the New York USO Campaign.

Chairmen of the five sub-divisions of the Textiles Division are as follows:

Cotton—Joseph Andrews, J P Stevens & Co

Linen—Dave Burke, Marlene Linens

Rayons—Larry Weiss, Robbins Mills, Inc

Woolens—John Rae, J P Stevens & Co

Manufacturers of Men's and Boys' Clothing—John Exton, Bachmann Uxbridge Worsted Corp

Over 75 divisions have to date been set up in the Commerce and Industry Division of the USO $1,380,000 campaign so that all the business houses of the city may have a chance to participate in raising the funds for hospitality and welfare of the men and women of the armed forces. The New York USO Campaign headquarters is at 50 Broad Street, New York 4.

• USDA Bureau Aids ASTM Program

The Bureau of Agricultural and Industrial Chemistry, U S Department of Agriculture, has accepted much of the responsibility for a nationwide interlaboratory program to provide a basis for more standardized use of instruments in the analysis of cotton fiber. The program, sponsored by the American Society for Testing Materials, promises to lay the foundation for widespread improvement in the evaluation of cotton as an aid to more efficient utilization, according to Dr G E Hilbert, Chief of the Bureau in Washington.

Dr Walter M Scott, Assistant Chief, is serving as chairman of the sponsoring Task Group set up by the Society under Committee D13, Subcommittee A-1, Section 1 on cotton; and the Southern Regional Research Laboratory in New Orleans is carrying out the details of the progrgam.

T H Hopper, head of the laboratory's Analytical and Physical Division, has organized the work and is maintaining contacts with the cooperating laboratories; while the Cotton Mechanical Processing Division, under the leadership of R J Cheatham, is rendering assistance in the preparation of the cottons selected for check testing.

Eighty of the 154 firms and agencies in the United States known to possess Fibrographs, Micronaires, or Pressley fiber testing instruments have accepted invitations to participate in this program. Each participating laboratory will analyze by its usual methods identical coded samples of 10 cottons, representing several varieties over a wide range of length, strength, and fineness. Reports on these tests will be tabulated, using code numbers to identify individual laboratories, in order to provide information leading to more uniform and more effective application of modern textile testing equipment and techniques, to point out opportunities for the improvement or modification of existing equipment and procedures or to develop entirely new procedures for fiber testing.

• Jacob Ziskind Memorial Scholarship Established at LTI

The Lowell Textile Institute has revealed the establishment of the Jacob Ziskind Memorial Scholarship at the school in honor of the late president of the Merrimack Manufacturing Company. Employees of the company, in a "fitting and practical manner" honored Mr Ziskind with subscribed funds in the amount of $4300, the interest from which will be used to enable students from Lowell and vicinity to attend LTI.

Plans for the scholarship's establishment were drawn up at the request of Company employees by the Merrimack Employees' Recreation Association and the Workers' Independent Union immediately after Mr Ziskind's death. The two group presidents and the president of Lowell Textile Institute will comprise a committee of three for administering the fund. Officials of the LTI Alumni Association will act in an advisory capacity.

Candidates for the scholarship will be screened by the Institute's Committee on Scholarships and preference will be given to employees of the Merrimack Manufacturing Company and their family members. Announcement of awards will be made by Lowell Textile Institute, the Merrimack Employees' Recreation Association and the Workers' Independent Union. Application will be made through the Alumni Office, Lowell Textile Institute.

The first student to benefit from this scholarship will be enrolled at Lowell Textile Institute in the Fall of 1951.

• 15 Frenchmen Observe U S Testing Techniques

Under the auspices of the Technical Assistance Division of the Economic Cooperation Administration, fifteen French business men were conducted last month through the main laboratories of the United States Testing Company, Inc, in Hoboken, N J. The visitors, representing owners, managers and workers from French industry will visit many companies in this country to acquire an overall picture of techniques and methods. During their stay in the U S, they will be under the direction of the National Management Council of the United States of America, Inc.

H M Block, vice president in charge of advertising for U S Testing Co, welcomed the guests, after which Mr Fish of the Sales Division highlighted the scope of plastic testing facilities and activities of the Company. D L Barail, chief of the Biology and Bacteriology Department, spoke about the specific work conducted in his department.

After the morning talks the visitors and E B Powers of the National Management Council were luncheon guests of United States Testing Company at the Swiss Town House.

The afternoon session consisted of a tour of the various laboratories.

• Construction on New ACC Site Begun

Construction has begun on a 64,000 square foot building, to be leased by the American Cyanamid Company in Los Angeles' Central Manufacturing District. It is being built under contract with John M Stahl and Buttress and McClelland, Inc.

Among those participating in recent ground-breaking ceremonies initiating the construction were: P J Ronan, resident manager of Cyanamid's West Coast operations; Edward Larson, regional manager, Lederle Laboratories Division; H L Oak, Calco Chemical Division and S T Dahl, West Coast sales manager.

44,000 square feet will be devoted to warehouse space and 20,000 to air-conditioned offices. Additional land at the site affords an expansion potential. Total term rental for the building, which is scheduled for completion by September 1, reportedly will approximate $1,000,000.

At present, the Cyanamid organization occupies office and warehouse space at a number of locations in the City of Los Angeles and at Azusa. The main purpose to be achieved is the consolidation of these facilities so that the several divisions of the Company may better serve Los Angeles and West Coast customers. It will enable Cyanamid to meet the varied requirements of all its Divisions for office space, laboratories, blending rooms, warehouse facilities, and loading docks.

The basic construction of the proposed building will be precast concrete and steel girder with Arizona sandstone of various colors for the office front. Construction design will include a central patio to provide interior offices with daylight. Air-conditioning will be provided for the office area as well as certain special storage areas. The site of the building is in the Central Manufacturing District at the junction of Eastern Avenue and Harbor Street, six miles from the civic center. The building will be served by switch track of the A T & Santa Fe Railroad, outside the congested business district.

Among the units of the Company which will use the new facilities are Calco Chemical Division's Pigment Department and Bulk Pharmaceutical Department; The Industrial Chemicals Division, The Plastics and Resins Division, and Lederle Laboratories Division's branch office and regional sales office. Cyanamid's West Coast executive offices, now located at Azusa, will also be in the new building.

The consolidation of the Los Angeles offices is reported to be part of an overall plan which calls for a similar consolidation of Cyanamid offices in other major cities of the U S and Canada.

• Short Course in Reprocessed Fiber

President Martin J Lydon of the Lowell Textile Institute, Lowell, Mass, has announced the establishment of a short course, under the sponsorship of the National Association of Waste Material Dealers, Inc, to be held June 11-15 at the Institute. The course, which will be carried out under the direction of Professor James H Kennedy, Jr, of the LTI wool department, will consist basically of lectures, exhibits, discussion groups, and tours relative to the manipulation of clips and rags, old and new, into fiber suitable for use in the woolen industry. Several trade association representatives, waste dealers, garnetters, representatives of the armed forces, mill men, etc, will be on the program.

Tuition for the complete course is $50.00. No charge will be made for guests who attend on Monday, June 11, only. Room and board is available at the college dormitories.

Registration may be made by contacting Prof Kennedy at the Institute or Ben Kaufman, director of public relations, National Association of Waste Material Dealers, Inc, Times Building, New York, N Y.

• UNH Offers Special Courses

Special courses designed to show how to teach elementary and advanced clothing construction and tailoring, textiles, and home and family life have been added to the offerings of the University of New Hampshire's July 2-August 10 Summer Session.

Professor Helen F McLaughlin, chairman of the UNH home economics department, and Mabel A Turner, head of the home economics department at Newton High School (Newtonville, Mass) will teach the course.

• NBTI Club Hears Dawson

Joseph Dawson, vice president of the parent alumni group and member of the New Bedford Textile Institute Board of Trustees, was the chief speaker at the March 28th meeting of the NBTI Club of New York. Assisting Mr Dawson was another board member, Peter Manchester, superintendent of the Berkshire Fine Spinning Mill, Fall River, Mass.

The following slate of officers were installed at the meeting:

President — Cameron Baker, United States Testing Co, Inc

Vice President—Walter Carter, Cohn-Hall-Marx

Secretary—Albert Malick, Emkay Corporation

Treasurer — Joseph Crowley, United States Testing Co, Inc

Member of Board of Directors for 3 years—Andrew Bauer, Jr, Seneca Textiles Company

Other Members of the Board who continue to serve are:

Daniel Donavan, Seneca Textiles Company

Norman Gobiel, J P Stevens Company

In accepting the presidency, Mr Baker expressed appreciation to the retiring, founding President, George Hotte of A M Tenney Associates. Mr Baker stated that George Hotte's efforts to reactivate the New York Chapter of the Alumni Association were instrumental in rebuilding a Club which has proved enjoyable and useful to all concerned.

Mr Dawson and Mr Manchester presented a review of activities at the Institute in New Bedford. They touched upon building plans for expansion, financial status, sports activities and other pertinent topics. A discussion period followed.

• NCSC Unable to Meet Demands for Textile Graduates

Members of the North Carolina Textile Foundation were recently told by Dean Malcolm E Campbell that the School of Textiles at North Carolina State College is unable to meet the industrial demand for its graduates. Mr Campbell spoke at the foundation's annual meeting in the College's School of Textiles, appearing on the program with Chancellor J W Harrelson of State College, Controller W D Carmichael, Jr, of the Consolidated University of North Carolina, and officials of the foundation.

The school, Dean Campbell said, will graduate approximately 184 seniors this year, but he said there are jobs for many more than that number. The demand for textile graduates, he reported, is "the heaviest in the history of this institution."

Mr Campbell was introduced by J C Cowan, president of the Burlington Mills Corporation, who was elected chairman of the meeting. W J Carter of Greensboro, president of the foundation, opened the session and made the presidential address.

Other speakers on the program were David Clark, foundation secretary, and Leroy Martin, who announced that the foundation's assets were in excess of $1,200,000.

Foundation officers, in addition to President Carter and Secretary Clark, are A G Myers of Gastonia, vice-president; and W H Ruffin of Durham, treasurer.

A buffet luncheon was served in the School of Textiles after the meeting followed by a tour of the school.

• Stander Stoker Changes Name

The Standard Stoker Company, Inc, which has diversified its activities in the past several years, has changed its corporate name to the "Read Standard Corporation". All business will be conducted under that name. No change in ownership, management or personnel is involved. Present products of the organization include chemical processing equipment, axial flow positive pressure blowers, stokers, baking machinery and ovens.

Operations under the new name are separated into two major divisions, namely: the Bakery-Chemical Division and the Blower-Stoker Division. The divisional operation heretofore designated as Read Machinery Division is now to be known as the Bakery-Chemical Division.

The Bakery-Chemical Division at York, Pa, will be manufacturing, engineering and sales headquarters for the Readco line of bakery and chemical equipment. The Booth plant at Los Angeles will be headquarters for west coast operations of this division. The Erie, Pa, plant will be manufacturing and engineering headquarters for the Blower-Stoker Division with sales headquarters at New York. Executive and divisional sales offices will be maintained as heretofore at New York.

• MIT to Give Summer Course in Textile Research

The 1951 Summer Session of the Massachusetts Institute of Technology, to be held July 2-27, will feature a special course in "Principles of Textile Research" designed to review recent developments in methods and equipment. It will be given under the direction of Professor Edward R Schwarz, head of the textile division in the department of mechanical engineering. Emphasis will be on the functioning of a textile research laboratory in connection with quality control programs, new product development, instrumentation, processing, and the field of education at college level.

Tuition will be $125 for the course.

More complete information may be obtained from Professor Walter H Gale, Room 3-107, Massachusetts Institute of Technology, Cambridge 39, Mass.

• Tennessee and North Carolina Added to SRRL Jurisdiction

Tennessee and North Carolina have been added to the 9-state agricultural area served by the Southern Regional Research Laboratory since its creation in 1938. They were formerly in the area served by the Eastern Laboratory in Philadelphia.

Dr G E Hilbert, Chief, Bureau of Agricultural and Industrial Chemistry, announced the transfer in New Orleans at the 1951 conference of state experiment station and Southern Laboratory research workers on March 19-21. About 50 persons, including a number from the Agricultural Research Administration in Washington, attended.

The change in regions is being made because agricultural interests in North Carolina and Tennessee are so closely related to those of the Cotton Belt states already being served by the New Orleans Laboratory, Dr Hilbert explained.

Although cotton was the principal subject discussed by the research workers, Dr C H Fisher, Director of the Laboratory, touched on other commodities in his summary of crop utilization research in the South for the past year.

He named three developments of the Laboratory—a cotton opening machine for use in textile mills, maleo-pimaric acid from pine gum, and a new antioxidant termed conidendrol—which are in commercial use, or soon will be. Several other developments are now being evaluated by industry for possible commercial applications, he said, including terpene hydroperoxides for use in synthetic rubber production, acetylated cotton for laundry press pad covers, soluble cotton yarn, a chemical treatment that makes cotton harder to soil and easier to clean and tightly-woven fabrics which resist the penetration of air and water.

NAMES IN THE NEWS

• Paul M Bigley, Thomas R Boyle

PAUL M BIGLEY, assistant general sales manager, Michigan Alkali Division, Wyandotte Chemicals Corporation, has been granted a leave of absence to serve with the Economic Stabilization Agency effective April 9. The announcement was made by Bert Cremers, division vice president. THOMAS R BOYLE, as administrative assistant to the general manager, will assume all duties handled in the past by Mr Bigley.

Paul M Bigley

• E K Gladding, H E Ford

DR ERNEST K GLADDING will retire June 1 as director of the Du Pont's Development Department and HENRY E FORD, who has been assistant director of the department since 1942 will succeed him.

For the past six years Dr Gladding has been the head of the department which is responsible for keeping the company informed of developments in its established businesses, studying new material sources, investigating products in which the company might be interested and reviewing possibilities for growth and expansion.

He has been with the company 41 years, starting as a chemist in the Eastern Laboratory of the Explosives Department at Gibbstown, N J, soon after his graduation from Worcester Polytechnic Institute. During World War I, Dr Gladding supervised production of materials for the government at plants in Parlin, N J, Hopewell, Va, and Old Hickory, Tenn. When the nation began building its own organic chemicals industry after the war, he was appointed chemical director of the dyes plant at Deepwater Point, N J.

In 1920 Du Pont became interested in the textile fiber field and Dr Gladding was transferred to Buffalo, N Y, as plant superintendent of the Du Pont Fibersilk Company. This firm, later the Du Pont Rayon Company, ultimately became the Rayon Department. Dr Gladding advanced through the posts of assistant production manager, production manager and manager of the technical division until he became manager of the nylon division of the Rayon Department when that division was formed in 1938. From that time until he was called to the Development Department, he guided research on nylon, the expansion of its manufacturing facilities, and the development of its uses and distribution.

Francis H M New

• Francis H M New

Riggs and Lombard, Inc, Lowell, Mass, have announced the appointment of FRANCIS H M NEW as their Southern representative. He will be located at Greenville, S C (P O Box 1083).

A holder of three patents in the textile printing and drying fields, Mr New owned and managed a business for erecting and servicing mechanical power transmission equipment and textile machinery prior to joining R & L. At Glendale Mills, Inc, he held the position of plant engineer for three years.

• Weigel, Shaw, Cole, Manning, Parriott

RUSSELL C WEIGEL, manager of one of the industrial sales sections in the du Pont Polychemicals Department, has been promoted to the position of assistant manager of the department's planning division. Mr Weigel was in charge of sales to the paper, textile, and leather industries.

JERRY D SHAW has been named to succeed Mr Weigel, and ARTHUR M COLE replaces Mr Shaw.

The above changes brought about the advancement of R J MANNING, former head of New England sales to the paper, textile, and leather industries. Mr Manning succeeds T A PARRIOTT as Denver district manager for "Zerone"-"Zerex" antifreeze sales. Mr Parriott will be New York district sales manager of the refrigerant, food and petroleum section until his retirement this summer.

• F T Peters, A L Davis, Ely Balgley, B H Silverman

In expanding the activities of its technical development division to include regular representation in Washington, the Heyden Chemical Corporation has announced that DR FRANKLIN T PETERS, manager of their Market Development Department, will spend two days a week in that city to provide special service for defense agencies.

DR A L DAVIS has been assigned to the market research section of the Heyden Market Development Department; ELY BALGLEY has been appointed group leader in charge of the Applications Group of the department; and B H SILVERMAN, formerly of the Mellon Institute, has joined the Applications Group as a chemist.

• Rutteman, Hartzell, Stansbie

C H B RUTTEMAN, managing director of Hercules Powder Company Limited (an English subsidiary of Hercules Powder Company), and HARRY HARTZELL, supervisor of production, will be directors of a new company being formed for production of cellulose flake in England. (See page 300, April 30 issue). E H STANSBIE, Nelsons Silk Limited, will be managing director. Mr Stansbie recently returned to England from this country after conferring with Hercules officials concerning details of the new company's establishment.

Harry Hartzell

C H B Rutteman

Chester A Strodl

• Chester A Strodl

CHESTER A STRODL has joined the Textile Fibers Department of Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation, to assist in sales development work on the use of dynel in the knitting trades.

• Charles A Thomas, William M Rand

The Board of Directors of Monsanto Chemical Company last month elected Dr Charles Allen Thomas president to replace William M Rand, who retires under the company pension plan. Dr Thomas, prominently identified with production of the atomic bomb and co-author of a plan for control of nuclear weapons, took office on May 1. He had held the office of executive vice president with Monsanto since 1947.

Mr Rand continues on the company's board. He entered the organization in 1921 through the Merrimac Chemical Company, Everett, Mass, which was acquired by Monsanto in 1929. With the liquidation of Merrimac as a separate corporation in 1937, to operate as Monsanto's Merrimac Division. Mr Rand became division general manager and a Monsanto vice president. In 1943 he became a member of the Executive Committee and was transferred to St Louis. He was elected president on October 1, 1945.

• E A Leonard

E A LEONARD, Research and Development Division, Alexander Smith & Sons Carpet Company, has accepted an invitation for membership in the National Technical Task Committee on Industrial Wastes. The invitation was extended to Mr Leonard by Leonard A Scheele, Surgeon General of the Federal Security Agency.

Richard P Barber

• Richard P Barber

RICHARD P BARBER of Taunton, Mass, has been granted a fellowship at the Institute of Textile Technology, making him the third member of the class of 1951 at Bradford Durfee Technical Institute to have been so honored. Announcement of awards to ROBERT STAPLES and THEODORE WILLIAMSON, JR, was made previously. The fellowships lead to an M S degree.

• Joseph Bianco

JOSEPH BIANCO, chemist at the Central Research Laboratories of General Aniline and Film Corporation has transferred to the firm's Rensselaer, N Y, plant. He will continue his work on celliton dispersions, it is announced.

Mr Bianco went with the Hooker Electro Chemical Company in 1943. He has been with the Research Laboratories since April, 1946.

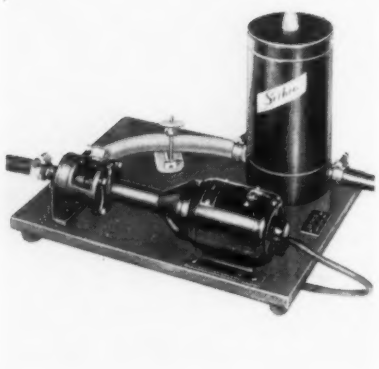
• Alan Mayer, Walter Spencer

ALAN MAYER will make Cincinnati his headquarters and will cover Ohio, Illinois, Indiana and Northern Kentucky for Arnold, Hoffman and Company. Mr Mayer succeeds WALTER SPENCER, who resigned to accept another position. Since the end of the last war, Mr Mayer has worked in Arnold, Hoffman's Providence (R I) Research Laboratories.

• E Montgomery

BRIGADIER GENERAL EDWARD MONTGOMERY, U S Army, Retired, has been appointed Assistant to the Executive Vice President of Chemical Construction Corporation. His duties will include the coordination of the work of the several departments of the company.

NEW PRODUCTS AND DEVELOPMENTS



Sethco HHUE-5 Filter Pump

• Sethco Filter Pump Model HHUE-5

Model HHUE-5, a new filter pump unit rated at 50 gallons per hour, has been announced by Sethco, 105-07 150th St, Jamaica 4, N Y. This power operated filter is equipped with an asbestos impregnated furfuryl alcohol resin filter cylinder and a Hastalloy pump and fittings.

Sethco cites as the pump unit's advantages: complete resistance to electroplating and industrial solutions; handling of high temperature solutions up to 130° C; no loss of expensive solution; clear filtration; simple operation. In addition, the filter tube can be backwashed or washed, it is stated.

The filter element is composed of a cotton yarn wound around a stainless steel supporting core. Porous stone and porous carbon filter tubes are furnished for concentrated acid and alkali solutions, respectively. Sethco points out that the tubes may be used over and over again.

• New Acetylene Process Due for Expansion

A chemical process for the production of acetylene, which employs a partial oxidation process involving the high temperature reaction of methane and oxygen, is slated for expansion at the Texas City, Texas, plant of Carbide and Carbon Chemicals Company. It is pointed out, however, that the additional acetylene produced will be used within the plant.

The Texas City unit was the first commercial installation for the process, in which two highly reactive feed materials are chemically combined to produce a gas mixture containing essentially acetylene, with smaller percentages of carbon dioxide, methyl acetylene, diacetylene, vinyl acetylene, and other residual gases. A purification unit separates the acetylene from the mixture. Currently, the plant is said to have the largest acetylene production capacity of any similar one in this country by any process other than from calcium carbide.

Selection of the partial oxidation process for the manufacture of acetylene at Texas City is reportedly based on the availability and proximity of basic materials and the fact that appreciably less power is required than in other methods. Initial experimental work was started in 1945 by various units of Union Carbide and Carbon Corporation.

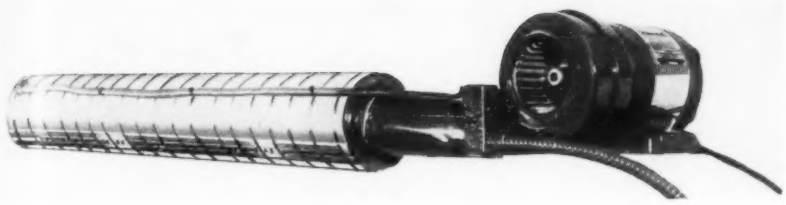
It is expected that the process will play an important part in the chemical field since acetylene gas is a valuable raw material in the manufacture of several industrial chemicals, such as vinyl chloride, acrylonitrile, and acetic acid. While many of these chemicals are also made from ethylene, there are several that are made from acetylene exclusivly, including vinyl acetate, trichlorethylene and chloroprene. Commercial operation of the partial oxidation process, however, probably will be confined to large-scale installations in areas having large natural gas reserves, and to locations where the acetylene gas produced can be utilized directly adjacent to the point of manufacture. With the basic materials available at relatively low cost at Texas City, the process is a natural outgrowth of Carbide's needs for acetylene for the production of other industrial chemicals—especially its resin intermediates, vinyl chloride and vinyl acetate.

The new process is generally expected to be only supplementary to the use of calcium carbide, the present major source of acetylene gas. This is probably best attested by the considerable expansion of Union Carbide's facilities for production of calcium carbide at the present time.

• Roxbury Reduces D-Stat B Prices

Roxbury Chemical Works, Inc, Centredale, R I, has announced, as a result of the installation of additional production facilities, a 10 per cent price reduction in the cost of D-Stat B, their antistatic agent for polystyrene. J E Buonanno, Roxbury president, expects total sales volume to double over 1950.

The product, a colorless, odorless, nontoxic and noninflammable liquid is sold in ready-to-use form.

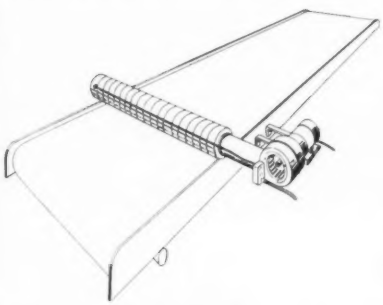


Mamco Heat Blower

• Master Appliance Electric Heat Blower

Master Appliance Manufacturing Company of Racine, Wisconsin announces the availability of an electric heat blower for use on printing presses, conveyor belts and other applications. The unit, originally developed for H H Heinrich Co of New York for the printing trade, operates on 220 volts and draws 40 amps.

Air is heated to 400° F at the outlet and forced from an opening ¼" high and 36" long at the rate of 4800 feet air velocity per minute. The air supply is developed by an electric motor driven blower; heat is developed by electrical heating elements.



Schematic Showing Application of the Mamco Heat Blower

• New SFTS Service and Facilities Available

South Florida Test Service, 4201 N W 7th Street, Miami 34, Fla, has announced the availability of service and facilities for parallel light transmission and haze determinations on plastic materials following exposure in Southern Florida, in accordance with Fed Specs LP-406a Method 3021 and Spec MIL-6887, and in conformance with ASTM D1003-49T and other specifications.

The installation of the Hunter Pivotable-Sphere Hazemeter and Photometric unit is now completed, as well as additional instrumentation for testing of plastics, textiles, paints, rubber, etc, to sunlight (direct, under glass and filters) and weathering to inland or salt atmospheric, tidewater, total immersion and special tests.

• Emery 955 Dimer Acid Established as Sales Product

Following two years testing and standardization as a development product, Emery 955 Dimer Acid has been established as a sales product by Emery Industries, Inc, Cincinnati. A liquid, dibasic acid of a viscous nature, the product is said to possess excellent heat stability and low volatility. Molecular weight reportedly approximates 600.

Emery 955 Dimer Acid (dilinoleic acid) undergoes the carboxyl group reactions typical of a monomeric acid, the manufacturer states, as well as allowing polymerization, resinification and similar type reactions with poly-alcohols, polyamines, polyvalent metals, etc. Pointing out that it forms both soluble and insoluble soaps and acts as a bodying agent in surface coatings, Emery suggests 955 Dimer Acid as a partial replacement for hard-to-get drying oils.

Long chain polyesters of the product have typical rubber-like properties; polyamide resins of Dimer Acid exhibit low melting and water-resistant properties.

Bulletins on the product may be obtained upon request (Emery Industries, Inc, Dept 5, Carew Tower, Cincinnati 2, Ohio).

• Dynel Half-Hose Introduced

Men's rib-knit half hose of dynel are being introduced to the consumer through retail stores this month, one of the first of many uses for the new acrylic fiber in men's apparel.

The hose are said to have the appearance and hand of fine cashmere, along with being tough and long-wearing. Reported to be completely washable in soap or detergents, they are also said to retain their tensile strength through repeated launderings, do not shrink or lose shape.

Other characteristics include a strong resistance to wear and long laundry life due to the high wet and dry strength and the chemical resistance of the dynel. The hose are moth- and mildewproof under any conditions, as well as being comfortable to wear, even in high humidity, it is reported.

• Automatic Waste Water Sampling Systems

Engineers of the Hagan Corporation, Pittsburgh 22, Pa, and Hall Laboratories, Inc, water consultants, have cooperatively worked out applications of the Hagan Ring Balance Meter in five different automatic sampling systems for waste water. The applications afford a choice between intermittent and continuous sampling, from lines flowing under pressure or from open channels. In each case the Ring Balance Meter is used to indicate, integrate and record flow, as well as to actuate the sampling mechanism.

The intermittent sampling systems employ a Ring Balance Meter to measure the flow in the line or channel. The meter is equipped with a device which generates electrical impulses proportional to flow. These impulses are fed into a counter which adds these up to some desired value, after which the counter makes a contact on a timing relay. For intermittent sampling from a line flowing under pressure, the timing relay opens the solenoid valve in the sampling line from the main flow line for a given time for flushing and then admits the required sample to the sampling chamber. The valve is positioned to "flush" or "sample." The system then shuts down until another predetermined quantity of fluid passes, and the cycle is repeated.

For intermittent sampling from an open channel, the arrangement is approximately the same. A pump is used instead of the solenoid operated valve. The primary element at the meter uses a single dip tube and bubbler system in place of the orifice in the line under pressure.

For continuous sampling from a line flowing under pressure, a Ring Balance Meter with transmitter is used, which transmits a pneumatic signal which is linear with flow. This air signal then positions a diaphragm control valve to admit to the container a sample proportional to flow.

Continuous sampling from an open channel can be achieved by using a Ring Balance Meter with transmitter. The pneumatic signal, operating through a pneumatic controller, adjusts the output of a pump which delivers a sample proportional to flow.

Plant managers desiring additional information concerning sampling and gaging methods are referred to the discussion of "Gaging and Sampling Water-Borne Wastes," by Charles F Hauck, of Hall Laboratories, Inc, in the ASTM Bulletin of December, 1949. Reprints will be sent by the Hagan Corporation, Hagan Building, Pittsburgh, Pa, upon request.

• Maxitol No 10 Buffers Chrome

A new chemical product of the Dexter Chemical Corporation, Boulevard P O Box 1, New York 59, N Y, is said to have important applications in chromate dyeing of wool for preventing harshness, loss of strength and uneven dyeing. Aside from its initial resistance to bichromate action, the product ("Maxitol" No 10) becomes chemically bound to the wool, it is reported, to protect it throughout subsequent processing and for the life of the fiber. In addition, it is claimed that a softer, loftier hand is attained.

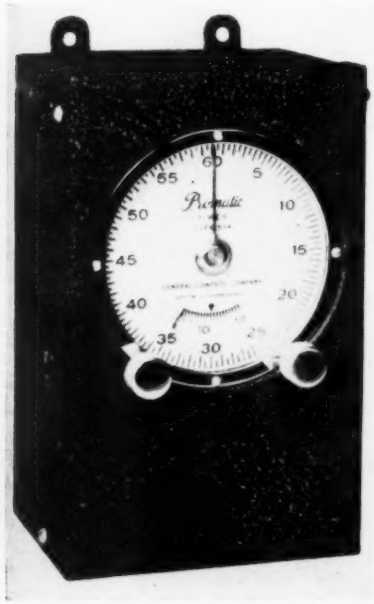
The company states that as a dye leveler, Maxitol No 10 is highly efficient, keeps dyestuffs well dispersed and facilitates their penetration into heavy fabrics and hard twisted yarns.

• Synchronous-Motor Timer

Accurate control of timed operations is the aim of the SY "Promatic" Timer, a synchronous-motor mechanism of the General Control Company, Boston 34, Mass. The product is said to actuate five s p d t load contacts independent of the timer-control circuits and can be used for all time periods between 0.5 second and 24 hours.

Separate solenoids operate the clutch and timing mechanism and the load contacts. The timer automatically resets for each new cycle and is available for 115 or 230 a c vol's. A "0" ring-drive assembly eliminates gears.

Dimensions (including terminal strips): 4½" wide, 4⅛" deep, 8" high.



GCC SY "Promatic" Timer

• Rexonize Process To Be Advertised Nationally

Rex Hosiery Finishers, Inc, Philadelphia, has announced a new national advertising campaign to popularize its newly developed Rexonize process and to contribute materially to the promotion effort of hosiery manufacturers using this process.

In announcing the move, Sidney T Simon, Rex President, stated that the company has launched a national advertising campaign in the pages of Good Housekeeping, Ladies' Home Journal and McCall's, reaching an average of 30,111,000 hosiery buying women each month. The advertising for the first year of this program has already been scheduled.

Mr Simon stated, "For manufacturers, the program will offer an opportunity to set a higher finishing standard for their goods and at the same time, to turn what is traditionally considered a manufacturing expense into a highly promotable sales weapon. I am, of course, speaking of finishing. We have a complete program available for manufacturers to use, including extensive promotional tie-ins, at the retail level."

The Rexonize Process, announced early in 1951, is developed by the Rex Hosiery Finishers, Inc, Philadelphia, Pa. It includes a series of checks and counter checks in an effort to insure product quality from the mill to the consumer and carries the Good Housekeeping Seal.

• Glycerine Retains Uses in Printing

A good example to the effect that newer developments in printing processes continue to make good use of glycerine's properties was recently pointed out by the Glycerine Information Service. They cited a method for spray printing on woolen upholstery fabrics, (Ciba Review 82, 2999, Oct 1950), in which glycerine constituted over 10% of the spray solution.

Unchlorinated wool is usually employed for purposes of spray printing, but in ordinary methods the dye solution does not penetrate and prints of poor rubbing fastness result. It is reported that better results can be obtained by first wetting out with a suitable agent and subsequently spraying with a dye solution to which this wetting agent has been added. As an example of a typical spraying solution:

Ingredient	*Grams*
Dyestuff	5-20
Intensifier	150
Water	330
Tragacanth thickening	300
Acetic acid 40%	50
Solvadine BL conc (10% sol)	50
GLYCERINE	100

After drying, the prints are steamed for 30 to 50 minutes at one-quarter atmosphere pressure to obtain satisfactory rubbing fastness.

Abbeon Flash-O-Lens

• New Portable Flash-O-Lens

The Abbeon Supply Company, 58-10 41st Drive, Woodside, New York, announces that their portable Flash-O-Lens is now coming off the production lines after exhaustive laboratory and field tests. The instrument combines a 7 power magnifying glass with a powerful light in the handle for spotlighting the magnified field of vision.

In this model a new Bausch & Lomb lens system has been incorporated in an effort to give a clearer, flatter field of vision and to reduce distortion and aberration. The housing for the lens system is made of Bakelite Plastic, which, the manufacturer states, gives 275% increase in strength over former models. The case is made of steel with a hard industrial chrome finish.

The length of the instrument is about an inch longer than a standard two-cell flashlight and batteries are the standard dry cell type.

Price—$14.85.

• New GDC Dyestuffs

Summaries of three of General Dyestuff Corporation's latest dyestuffs follow:

DIAZO BROWN RA-CF ——— a straight, substantive dyestuff for cotton, rayon, linen and silk dyeings. Upon development with Developer AMS-CF or Beta Naphtol it is said to give very reddish bright browns possessing good (3) fastness to washing on cotton, good to very good (3-4) fastness to washing on rayon, fairly good (4) fastness to light on cotton and good (5) fastness to light on rayon. Very good (4) dischargeability

with a neutral Rongalite discharge paste is reported, and by combination with other diazo dyes of equal dischargeability when coupled with Developer AMS-CF or Beta Naphtol, such as Diazo Orange LGA Conc CF and Diazo Black BHN Extra CF, a wide range of brown and related shades is available for white and colored discharge effects.

Developed dyeings of the product are reported resistant to change in shade and light fastness upon aftertreatment with urea-formaldehyde or melamineformaldehyde resins for improvement of crease resistance, the fastness to washing becoming distinctly improved by such resin aftertreatment. Excellent (5) fastness to dry cleaning, rubbing (crocking) and hot pressing are further advantages claimed of dyeings for rayon dress fabrics. Excellent fastness to perspiration permits use of this product especially on rayon and cotton lining materials, the company states; they also recommend it for dyeing yarns for knitted cotton and rayon sportswear.

As Diazo Brown RA-CF is virtually free from copper and manganese, GDC recommends it in place of sulfur colors for developed shades on rubberized fabrics when white or colored discharge effects are required.

Excellent solubility and good dyeing properties are said to make Diazo Brown RA-CF suitable for application to stock or yarn in circulating machines as well as to piece goods in various equipment. Although this dyestuff does not relevel well, the rate and degree of exhaustion can be readily controlled by reasonable additions of salt, the dyeing rate in the presence of 10% of salt owf being slow at 150°F and medium fast at the boil. Acetate (estron) effect threads in piece goods are considerably stained, while animal fibers and nylon are heavily stained.

ALIZARINE FAST GREY BLN-CF ———a straight, fast-to-light, acid dyestuff. It is reported to be outstanding among similar green-grey colors for wool in its ability to dye well by the monochrome or chromate (metachrome) methods of dyeing and in its ability to exhaust well onto wool from a neutral solution.

This product is also said to be valuable for dyeing wool in all forms by the topchrome (after-chrome) or chrome-mordant (bottom-chrome) methods. It is furthermore recommended by GDC for dyeing wool as a simple acid dyestuff from an acid bath to give distinctly bluer and brighter shades with the same fastness properties as by chrome dyeing methods.

The versatility of this dyestuff in application, its very good to excellent (6-7) fastness to light and its property of turning greener in artificial light combine to make Alizarine Fast Grey BLN-CF useful as a grey component in combinations for yarn, slubbing, stock, or piece goods that are not to turn red in artificial light. It is also reported useful as a principal component of pale greys.

An important application of this product is in the continuous dyeing of cotton-backed mohair or wool upholstery and automotive fabrics from a neutral bath in combination with such other dyestuffs as Alizarine Supra Blue A-CF, Anthralan Red BA-CF, and Amido Yellow EA-CF where very good light fastness is essential.

MONOCHROME BROWN EBC CONC CF———a straight chrome dyestuff. This is said to be an improved modification of a type that is similar to both Monochrome Brown BC Extra Conc and to Anthracene Chromate Brown EBA Extra Conc. It reportedly is characterized by better fastness to carbonizing, by better solubility and by better leveling properties for top-chrome dyeing, especially for dyeing in the Abbot machine, then exhibited by the two similar older browns. In fastness to light and in other fastness properties besides carbonizing, the differences among these three chrome dyes are not significant, the manufacturer states.

It is disclosed that although Monochrome Brown EBC Conc CF may be dyed by any of the three chrome dyeing methods, it gives distinctly stronger dyeings by either the top-chrome or the bottom-chrome methods than by the chromate method.

GDC recommends this product principally for application on stock, slubbing and yarn for use in overcoatings, suitings and blankets where carbonizing follows dyeing. They state that it is free enough from copper and manganese to be used on goods that are to be rubberized.

CURRENT TRADE LITERATURE

Simplified Practice Recommendation 252-51, Vinyl and Pyroxylin Coated Cotton Fabrics

Sup't of Documents, Government Printing Office
Washington 25, D C
Price: 5c (25% discount on orders of 100 or more)

This recommendation was proposed by the Plastic Coatings and Film Association, as a result of a survey which disclosed that more than 76 types and styles of vinyl coated fabrics and more than 88 types and styles of pyroxylin coated fabrics were being produced, the principal variations being in finished weights. The simplified list contains 20 styles of vinyl coated fabrics and 25 styles of pyroxylin coated fabrics. For each of these styles the recommendation gives the width in inches and linear yards per pound of the original grey fabric and the minimum width and weight per linear yards of coated fabric. The recommendation also contains a table enabling technicians and others to compare the fabrics on the basis of weight per square yard.

Abstract of U S Government Specifications for Textiles and Textile Products Requiring Fungicides

Nuodex Products Co, Inc
Elizabeth, N J
Available on request

93 specifications for the fungicide treatment of textiles are listed in this newest edition. The number and title of applicable Air Force, Coast Guard, Army, Navy and Federal Specifications are shown in tabular form. It also lists the material treated, the type fungicide required and the deposition necessary as well as brief descriptions and chemical constants of the Nuodex products permissible under the various specifications.

The Abstract is revised every three months. Revisions are automatically mailed to all previous recipients without charge.

Dynel Staple Fiber—General Information

Textile Fibers Department
Carbide and Carbon Chemicals Company
Room 308, 30 East 42nd Street, New York 17, N Y
Available on request

Dynel is described in a colorful, eight-page pamphlet in two parts. The first deals with the physical and chemical properties of the fiber and the second discusses these properties in terms of their value in fabrics. Properties covered include tenacity; elongation; stiffness; toughness; flammability; moisture regain; resistance to water, chemicals, insects and mildew; and light stability. Information on price and standard sizes and lengths of dynel staple is also included.

American Standard Methods of Measuring and Specifying Color

American Standards Association, Inc
70 East 45th St, New York 17, N Y
Price: 50c

Three new standards, developed by subcommittee 7 of ASA Sectional Committee Z58 on Opitcs, are discussed. Sponsored by the Optical Society of America under ASA procedures, these standards supersede the American War Standard Specification and Description of Color, Z44-1942.

Z58.7.1-1951 establishes conditions for spectrophotometry of nonluminescent materials specifically applicable to color measurement.

Z58.7.2-1951 establishes a procedure for the computation of color specifications from spectroradiometric and spectrophotometric data and a coordinate system for the presentation of color specifications.

Z58.7.3-1951 establishes alternative forms for color specifications, so that the attributes of color perception are more directly indicated than by the standard color specifications.

Subject Index to Volume 13, Bibliography of Technical Reports

Office of Technical Services
U S Department of Commerce
Washington 25, D C
Price: $1.00

The 13th volume is now indexed according to subject, making it the tenth to be issued. Volumes 7, 8, 9 and 14 still remain to be indexed. Indexes to Volumes 6, 10, 11 and 12 are also available at $1 each; to Volumes 2 and 3, 35c each. Check or money order payable to the Treasurer of the United States should accompany all orders.

The monthly *Bibliography of Technical Reports* lists additions to the 150,000-document Office of Technical Services collection of foreign and domestic reports. Together with the "Technical Reports Newsletter" it helps provide U S business firms with the highlights of federal and nonconfidential technical research.

Speedline Fittings Book

Horace T Potts Co
Erie Ave and D St, Philadelphia 34, Pa
Available on request

In addition to describing new low-cost, corrosion-resistant fittings, for which patents are pending, this book shows how light-walled Schedule 5S piping reduces cost of a typical layout.

Thirty-Seven New Developments from Fisher

Fisher Scientific Company
717 Forbes Street, Pittsburgh 19, Pa
Available on request

Scientific instruments, laboratory apparatus, and safety devices developed and introduced during the past two years by Fisher are illustrated and described. This six-page folder lists 37 new items, which have been made available since the company published "Fisher and E & A Specialties." The latter publication is also available to laboratories on request.

Automatic Colorimeter Grades Raw Cotton

Minneapolis-Honeywell Regulator Company
Brown Instruments Division
Station 40, Wayne and Windrim Aves
Philadelphia 44, Pa.
Available on request

Honeywell Instrumentation Data Sheet 10.10-3 describes the use and operation of a new self-standardizing apparatus which graphically evaluates the color of raw cotton. Produced by the Henry A Gardner Laboratory, Bethesda, Md, the instrument provides a direct reading on a two-dimensional scale of the graphic values of reflectance and yellowness for various grades of raw cotton. The apparatus is simple to operate and users of the equipment can learn to interpret and evaluate the results of measurements in a relatively quick time, the company states.

Sindar Reporter, Number One, 1951

Sindar Corporation
330 West 42nd Street, New York 18, N Y
Available on request

Data on all government specifications for mildewproofing fabrics under which Sindar's protective agent, G-4(R) (dichlorophene) may be used are summarized in chart form, grouped according to military specifications (those of the joint Army and Navy, U S Army, and miscellaneous).

Hercules Resins for Adhesives

Hercules Powder Company, Inc
Wilmington, Del
Available on request

A report on Hercules resins' contributions to film cohesion, surface tack, bond strength and other properties of adhesives.

Three broad adhesive types are covered: rubber, cellulosics and water soluble.

OPD Record of Prices on Chemicals and Related Materials

Schnell Publishing Company, Inc
30 Church St, New York 7, N Y
Price: $6.25

Volume 1A (244 pp, 9" x 12") is a record of price behavior, compiling from more than a million price quotations reported in the weekly issues of the *Oil, Paint and Drug Reporter* over the past four years. Its scope covers fully all the commercially known agricultural chemicals; botanical drugs; coal tar chemicals; drugs, fine chemicals; essential oils, aromatics; heavy chemicals; oils, fats and waxes; and textile and leather chemicals.

Brochure S146 (Electrostatic Voltmeter)

Specialties, Inc
Skunks Misery Road
Syosset, N Y
Available on request

Illustrates and describes operation of an Electrostatic Voltmeter used to detect the location of statically charged areas. The meter is reported to be an easily operated, hand-held unit containing its own power in the form of batteries.

Booklet on Emery 955 Dimer Acid

Emery Industries, Inc
Dept 5, Carew Tower
Cincinnati 2, Ohio
Available on request

This 16-page booklet contains a complete description, characteristics, specifications, shipping and handling data, and potential applications in soaps, greases, esters, polyamide resins, ester-amides, hot tin dipping, insecticides, and emulsion breaker. Also contained is considerable data pertaining to the utilization of Emery 955 Dimer Acid in bodied oils, varnishes, and alkyd resins. A complete bibliography is also included.

April 1951 Technical Reports Newsletter

Office of Technical Services
U S Department of Commerce
Washington 25, D C
Available on request

Productivity studies in American fields are among those made by the Anglo-American Productivity Council and reviewed here. Among other reports are those on agricultural chemistry, glass-fiber filters, Quartermaster textiles, and surface chemical phenomena in lubrication.

CALCO dyelines

Advertisement No. 20 of a series

PREPARED BY AMERICAN Cyanamid COMPANY CALCO CHEMICAL DIVISION, DYESTUFF DEPARTMENT, Bound Brook, New Jersey
New York • Chicago • Boston • Philadelphia • Charlotte • Providence

Calco®

Fast Printing Black for Acetate and Acetate Mixtures

Calcophenyl* Black Base is a desirable product for printing fast blacks on acetate and acetate mixed fabrics. It produces a rich bloomy black on ace-

tate, viscose, cotton, or fabrics consisting of mixtures of these fibers.

Calcophenyl Black Base requires oxidation to produce the proper shade, and this is accomplished by incorporating the oxidizing chemicals in the printing paste along with the dye, so that the oxidation is accomplished in the aging. Since the oxidation is not too difficult to accomplish and can be done with organic acids instead of mineral acids, the danger of tendering is eliminated. Inasmuch as an extremely low pH is not required, this product is readily adaptable to printing on naphthol prepared fabrics, and for delicate fabrics such as viscose sheers.

The principal advantages of printing blacks with Calcophenyl Black Base can be summarized as follows:

1. Full, bloomy black on acetate, viscose, cotton, or mixtures of these fibers.
2. Consistent printing properties on naphthol prepared fabrics.
3. No tendering action on fabrics.
4. A rich, ungreenable black is produced.
5. Excellent running properties with no tendency to cause etching of the doctor blade.

Ask your Calco representative for a sample and information on Calcophenyl Black Base.

*Trade-mark

A New Stabilized Azoic Violet

Calconyl* Violet B Powder, recently announced, produces a blue-shade violet of excellent brightness when printed on cellulosic fibers. This product is a desirable addition to an already extensive line of Calconyl Powders and Solutions. It can be used with assurance for either roller printing or screen printing on cotton or viscose fabrics.

Economy, clearness of shade and good working properties are some of the salient properties which recommend Calconyl Violet B Powder.

While the fastness properties of Calconyl Violet B Powder are not as good as the average vat or soluble vat print, they are good enough to make it very desirable for a wide range of fabrics. Principal fastness ratings are: Light . . . 3; Cotton Wash Test No. 3 . . . 4; Dry Crocking . . . 5; Wet Crocking . . . 3; Hot Pressing . . . 5; Acid or Alkaline Perspiration . . . 4.

Most textile printers will find this a useful dye to have in their drug rooms. Samples and information can be obtained from your Calco representative.

*Trade-mark

Calco Naphthosol Solutions

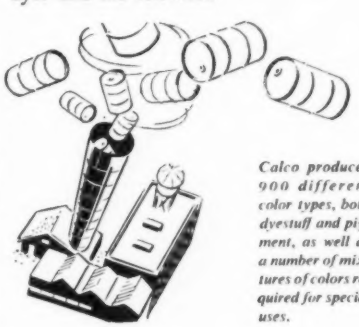
Solutions of the principal naphthols have recently become popular because of their labor-saving advantages. The former process required the use of solvents, alkali and time in order to prepare them for use, while the solution forms are readily usable without these preliminaries.

Calco Naphthosol® ASF and Calco Naphthosol SWF are available in the solution form. They represent the two most widely used naphthols and are suitable for all types of application wherever the powder types had formerly been used.

For the Textile Bookshelf

Light-Fastness Ratings of Vat Dyes on Cotton (Calco Technical Bulletin #813) by M. Babey, S. J. Luscian and R. J. G. Schofield. Provides the dyer with more complete and more exact information about light-fastness of vat colors on cotton.

Reprint of Paper by 1950 Olney Medalist:—A Review of Textile Coloring and Finishing Research by G. L. Royer (Calco Technical Bulletin #818). Covers the important scientific contributions in the dyeing of wool, acetate rayon, nylon and viscose rayon and the printing and finishing of textiles. Points up the need for increasing cooperation between the dyer and the scientist.



Calco produces 900 different color types, both dyestuff and pigment, as well as a number of mixtures of colors required for special uses.

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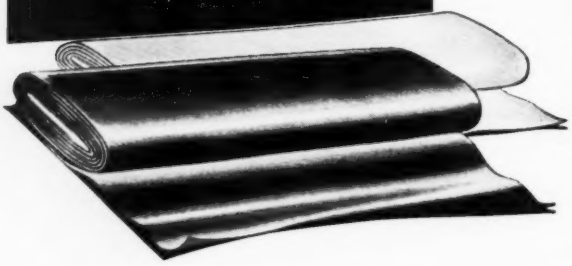

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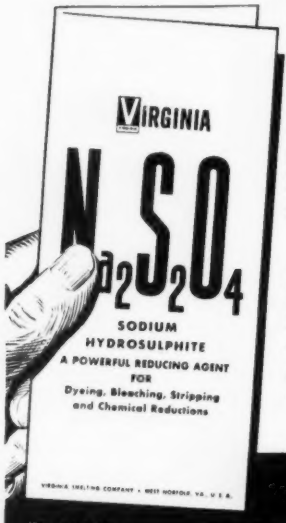
If you have been looking for a better hydro to use with your vat dyes, why not switch to "Virginia" Sodium Hydrosulphite? Its strength and uniformity from drum to drum, and stability in the bath, could make life easier in your dye house and cloth room.

Leading textile manufacturers and processors have approved "Virginia" Hydro for their operations. They depend upon its unvarying high quality and performance. They know that it is unsurpassed as a reducing and stripping agent.



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Two of the exclusive textile chemicals developed by Kali to meet today's processing problems efficiently.

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NEW! BLANCOPHOR® SC HIGH CONC.

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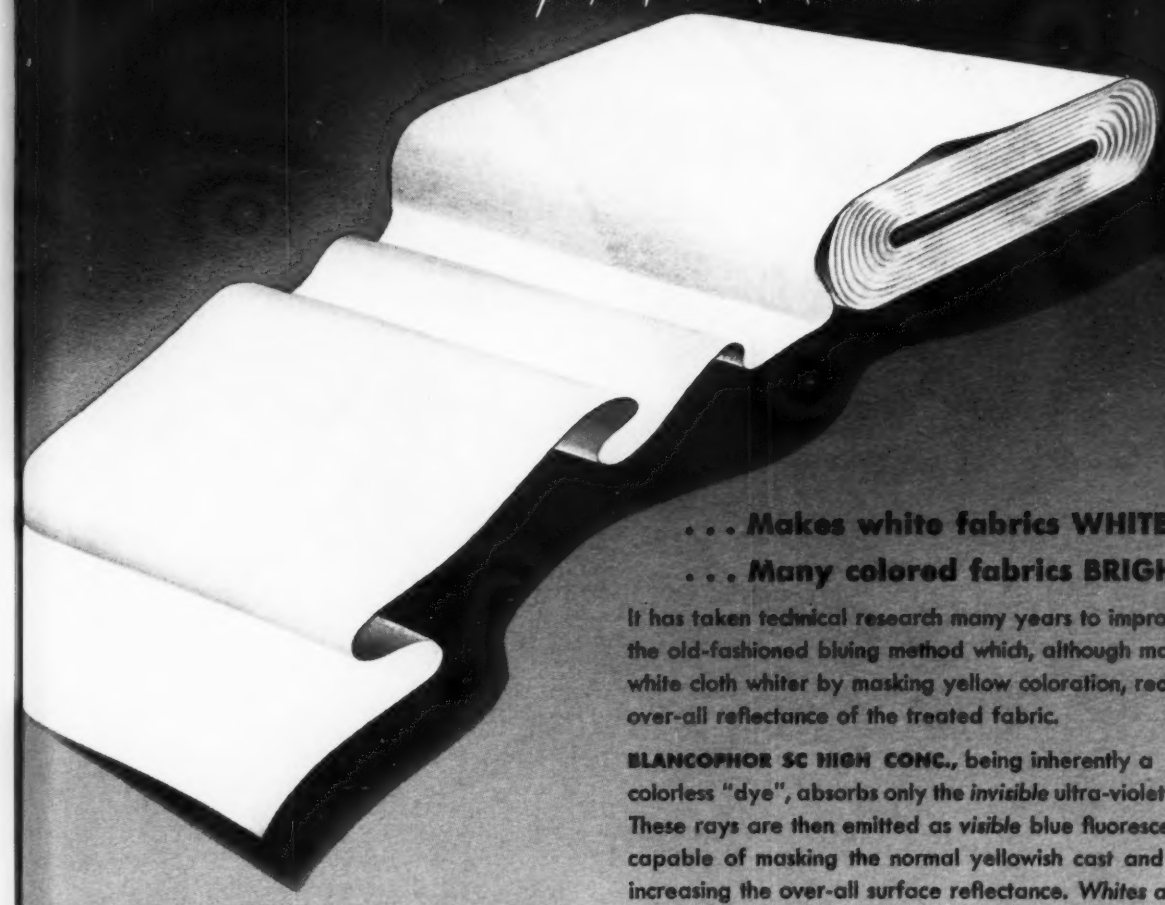

. . . Makes white fabrics WHITER

. . . Many colored fabrics BRIGHTER

It has taken technical research many years to improve on the old-fashioned bluing method which, although making white cloth whiter by masking yellow coloration, reduced the over-all reflectance of the treated fabric.

BLANCOPHOR SC HIGH CONC., being inherently a colorless "dye", absorbs only the *invisible* ultra-violet light rays. These rays are then emitted as *visible* blue fluorescence—capable of masking the normal yellowish cast and increasing the over-all surface reflectance. *Whites appear whiter—many colors appear brighter.*

BLANCOPHOR SC HIGH CONC., a substantive dyestuff, like the more common colored agents in this class, exhibits high affinity for cellulosic fibres and fabrics. It can be applied in the normal course of processing.

For complete technical data, kindly address Dept. 61

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IN CANADA: Chemical Developments of Canada Limited, Leaside, Toronto 17

On October 1st, 1951, the American Dyestuff Reporter as official publication of Proceedings of American Association of Textile Chemists and Colorists will publish an important

CONVENTION NUMBER

in connection with the 30th Annual Convention of the Association, at the Hotel Statler, New York, October 17-18-19, 1951.

•

Advertising space reservations already received for this important issue indicate that it will be the largest permanent record of individual product development for textile wet-processing that we have ever published.

We note a definite trend on the part of advertisers to prepare special copy for this individual issue. This will include factual information on all products produced — photographs of manufacturing and laboratory facilities, and specific information regarding technical cooperation available.

This decision to use factual copy (in this particular issue) is attributable to two important factors —

FIRST: This will be the largest Exposition ever sponsored by the AATCC and the greatest attendance in the Association's history is anticipated. One booth at the Exposition will be a focal point from which copies of the Convention issue will be distributed.

SECOND: The importance of acquainting those who are responsible for the expanding program of Government Procurement with just what each individual organization is capable of producing for the rearmament program.

A number of advertisers have reserved two facing pages in order to show photographs of plant and laboratory facilities, distribution warehouses, etc., as well as a complete listing of products.

We suggest that all advertising copy be factual and complete so that each organization can show their individual contribution to the attainment of a self-contained American chemical industry.

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Advertising Manager

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Santomerse No. 1, an alkyl aryl sulfonate with a minimum of 40% active ingredient, is the *all-purpose* detergent and wetting agent. It is a highly efficient detergent, a rapid wetter and penetrant, an easy rinser that holds particles of soil and unattached dyestuffs in suspension so they cannot settle on fabrics. It helps avoid crocking and aids in level dyeing.

Santomerse No. 1 is efficient in hard or soft water . . . in hot or cold solutions . . . in acid or alkaline baths. In hard water, anionic Santomerse No. 1 prevents the formation of insoluble metallic soap curds.

For information on the use of Santomerse No. 1 in any textile operation, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700 South Second Street, St. Louis 4, Missouri.

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Grinnell-Saunders Valves with CHEMICALLY INERT KEL-F* DIAPHRAGMS

Pat. App. For

Grinnell-Saunders Diaphragm Valves with KEL-F Diaphragms are living up to every promise made for them! At the right are reports from typical users.

KEL-F's resistance to chemical action, low cold flow, wide range of temperature application and exceptional flex life combine to make it the most important diaphragm development in years. KEL-F is chemically inert to all organic acids and alkalies in all concentrations. It withstands chlorinated aliphatic and aromatic compounds, concentrated nitric, chromic, hydrofluoric and sulphuric acids and most solvents which readily attack rubber and previous synthetic diaphragm materials.

While KEL-F is tough and flexible, it is not resilient. To provide resiliency for proper closure of the valve and to provide added support for the KEL-F diaphragm, it is backed with a rubber cushion. A free-floating method of attachment to the compressor assures an even closing pressure on the entire surface of the weir. A tube nut which floats as the rubber cushion presses down in closing the valve, eliminates excessive pressure on the diaphragm stud. The rubber cushions the closing force, thereby reducing wear and cutting action on the diaphragm. In accelerated tests, a 2-inch valve with a KEL-F diaphragm withstood over 80,000 closures, drop tight, against 80 pounds of air under water with no leakage and no visible signs of wear. Write for complete information.

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1. Chlorine and HCl gas with small amounts of acetic acid and acetyl chloride at 302° F. for 900 hours. Very much superior to material it replaced.
2. Mixed aromatic and ketone solvents at 230° F. and 10 psi for three months. No sign of deterioration.
3. Chlorinated organic chemical at 158 to 194° F. and 30 to 40 psi for nine months. No failure, no shutdown, no replacement.
4. Chromyl chloride at ambient temperature and 15 psi. Diaphragm condition good at end of thirty days' test.
5. Liquid chloral saturated with HCl at 158° F. for 408 hours. Well satisfied — have placed orders for additional diaphragms.

*"KEL-F" is the registered trade name for polytrifluorochlorethylene, an exceptionally stable thermoplastic. It is produced by the M. W. Kellogg Co.

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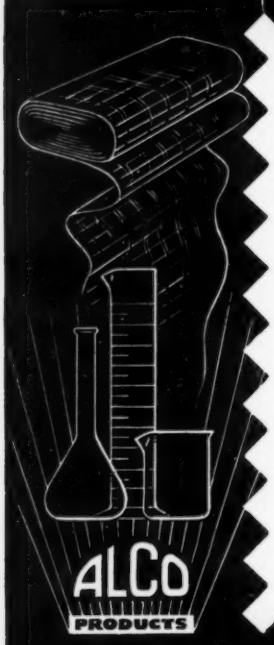

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ALCOGUM

Synthetic Thickeners for Latex Compounds.

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Dispersions of Latex Compounding Chemicals.

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GROUP-LIST OF SELECTED EXPIRED AND UNEXPIRED U. S. PATENTS FEATURING . . .

TEXTILE FINISHING PROCESSES

This specially compiled Group-List for American Dyestuff Reporter readers is comprised of 144 Patents, 40 of which have expired. Expiration dates are given on all unexpired Patents. The subject matter embraces:

CREASEPROOFING **WATER REPELLENCY** **TRANSPARENTIZING**

Dating from 1920 through October 1950, this Group-List shows the main technical claims of what Research Chemists in the Textile Industry are experimenting in . . . and patenting. A study of this new compilation will reveal many technical secrets to Research Chemists and may be the beginning of research which will result in new finishing compositions. Printed on one side of 8½" x 11" pages. Send for it today! Ask for TC-2..... **$5.00**

OTHER TIMELY PATENT GROUP-LISTS ON RELATED SUBJECTS

TEXTILE TREATING COMPOSITIONS, TC-1..... **$4.00**
153 Patent Extracts from 1867 through September 1950. Subjects are those compositions containing Organic Sulphoxy compounds, Organic Amines or Amides, and the Ether Groups.

SOAPS AND SYNTHETIC DETERGENTS, SD-3..... **$5.00**
Total of 65 of the 181 Patents shown have expired. Unexpired Patents show expiration dates. Includes Synthetic Detergents, Soap Processing, Water Softening Soaps, etc.

SYNTHETIC DETERGENTS, SD-2..... **$4.00**
Same general subjects as SD-3 with added items.

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SYNTHETIC RESINS WITH ION EXCHANGE APPLICATIONS..... **$5.00**
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PATENT PUBLICATIONS

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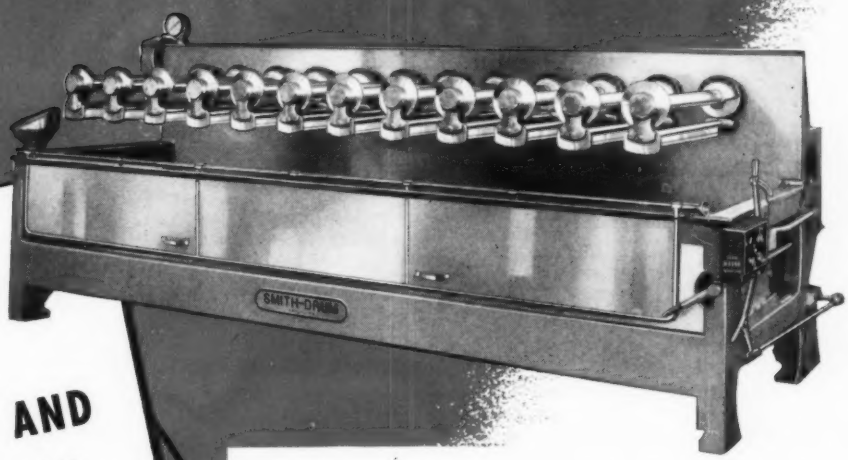

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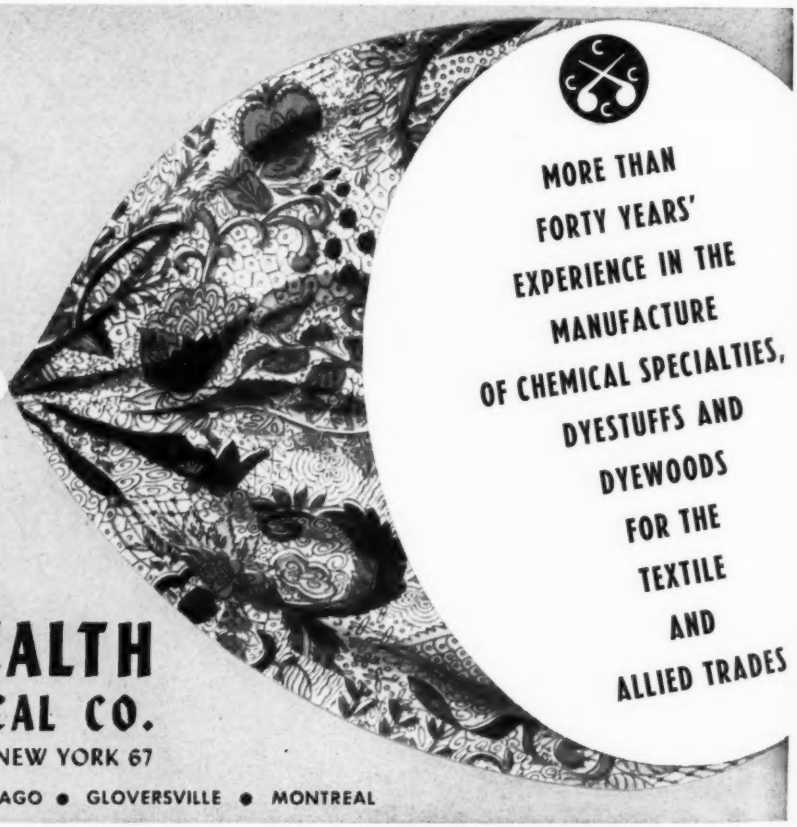

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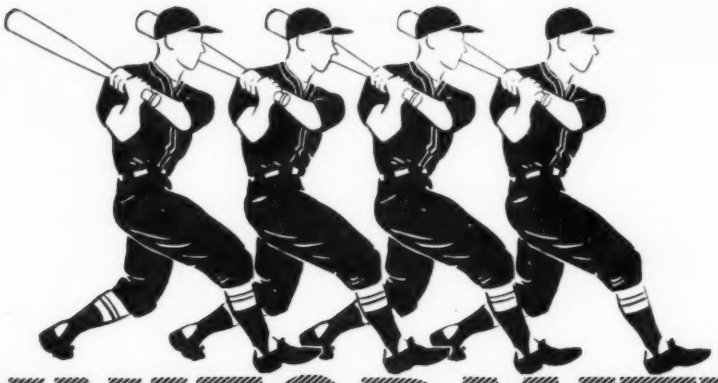

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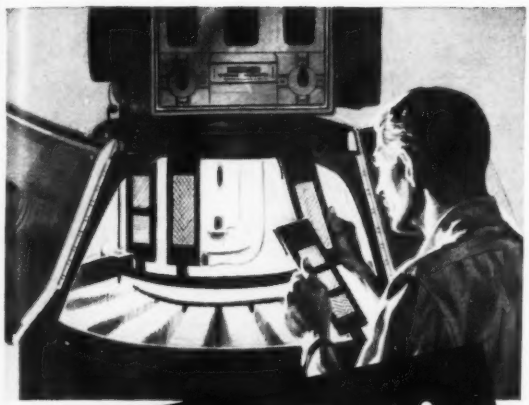

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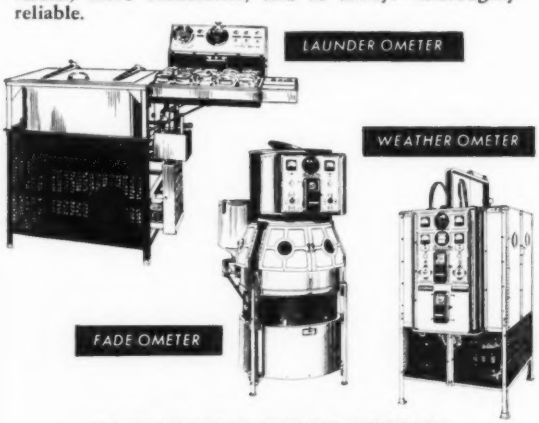

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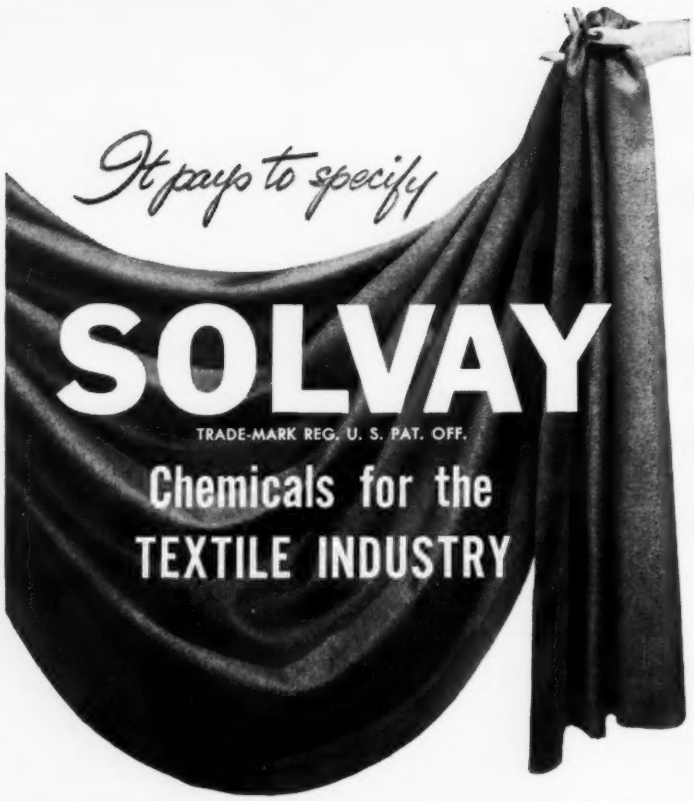

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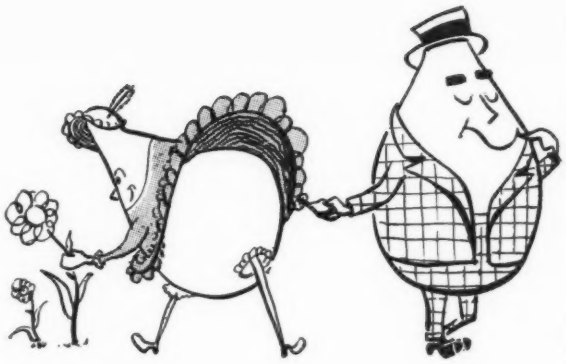

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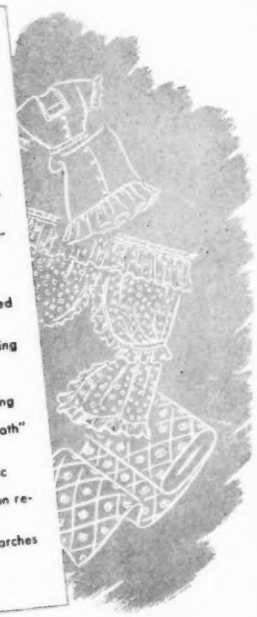

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Acid Value	195	201
Saponification Value	195	201
Unsaponifiable	—	2%
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